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The Physiotherapy Review

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The Physiotherapy Review

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The Relationship of Physical Therapy and Neurology

David Cleveland, M. D., Ph. D., F. A. C. S.

In recent years the common belief that neurologic diseases carry a hopeless prognosis has gradually faded until now it is realized among a great portion of the medical profession and of the laity that the outlook for the patient with a neurologic defect need not necessarily always be bad. The reason for this optimism has been due, to a great extent, to intelligent application of physical therapy. It is thus evident that the neurologist must work hand in hand with the physical therapist and he must have a working knowledge of physical therapeutic measures.

On the other hand, the physical therapist should have a knowledge of neurologic anatomy and neurologic physiology if he expects to aid neurologic patients. The purpose of physical therapy is to restore function to abnormal or pathologic tissues or to educate other tissues to take over the function of the diseased parts. Regardless of the tissue, its stimulating factor, the nervous system, must be considered. Before attempting to discuss some of the aids of physical therapy to neurologic diseases, it seems wise to review briefly a few anatomic and neurologic facts.

The nervous system consists of tissues having the function of sending and receiving impulses to and from all parts of the body. In the lowest form of life the nervous system consists merely of a reflex arc; namely, a receptor which receives an impulse and carries it to a cell which in turn sends an impulse to the motor part of the tissue, forcing it to move. In the progressively higher forms of life we find a series of reflex arcs, each able to act independently, but which are also associated by means of connecting nerve fibers so that an impulse conveyed from one motor cell may be related to a series of motor cells causing the entire organism to move as a whole. This then can be cited as an example of a lower motor neuron action: the cell of origin for the reflex arc lies within the arc, and the arc will remain intact without degeneration when it is severed from the arcs above it. Also, a motor stimulus is conveyed to its effector parts from the receptor.

The nervous system becomes more complex as we ascend the phylogenetic scale until the series of reflex arcs is connected by nerve tracts to a higher end station which will modify the stimuli conveyed through the motor system. The nerve fibers and cells, connecting the reflex arcs with each other and with the end station or brain, form the spinal cord.

In its embryologic development, the nervous system arises from a superficial plate of ectoderm called the neural plate. This plate gradually closes in and forms a tube called the neural tube. At its cephalic end growth of this tube takes place more rapidly than elsewhere to form the brain. Because of this increased growth, it tends to flex upon itself to form three distinct structures which are the forebrain, the midbrain and the hindbrain. Below this lies the spinal cord. In man, the forebrain continues to enlarge until it forms the massive cerebral hemispheres. In the lower animals, however, the cerebral hemispheres are much smaller because the cerebral cortex is limited almost entirely to the olfactory cortex or that part concerned with olfaction. That part of the forebrain lying beneath the cortex, namely, the basal ganglia, thalamus and optic chiasm, is present in the lower vertebrates and influences locomotion, posture

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and station. Also the midbrain with its reticular substance and nuclei, and the hindbrain with its important nuclei groups including the nuclei of the cranial nerves, are important in the lower vertebrates.

We have thus, in the vertebrates below mammals, five motor reflex levels: (1) The simple reflex or neuromuscular arc, (2) the spinal or series of reflex arcs, (3) the hindbrain or vestibular tract, (4) the midbrain or rubro-reticular-spinal pathways and (5) the basal ganglia. The pathways through which the basal ganglia exert control are not well known. In mammals, a sixth level becomes very important. This is the cortex, including the visual, sensory, auditory, motor and olfactory portions. The mechanism by which consciousness and mental reaction influence the cortical level are not known, but it is probably through a close interrelationship of all the various cortical areas together with somewhat indistinct areas in the frontal lobes. There is a very definite association between the cortical areas on the same and opposite sides, and thus a stimulus received through any of the senses may be followed by an appropriate action.

The motor cortex, or precentral gyrus, lies in the posterior part of the frontal lobe just ahead of the Rolandic sulcus and vessels which divide the frontal and parietal lobes. The uppermost part of this gyrus controls the foot on the opposite side of the body, and below this lie the controlling areas for the leg, thigh, trunk, arm and face, as though the body lay upside down with the foot at the top and the face at the bottom. Cells in the motor cortex send fibers as a band downward through the basal ganglia to the anterior part of the midbrain and hindbrain. This tract, the corticospinal or pyramidal tract, crosses at the caudal end of the hindbrain, or the medulla, to the opposite side to enter the spinal cord. As the tract descends in the spinal cord, fibers from the corresponding cortical area leave the tract and synapse with cells in the anterior horn of the spinal cord. These cells in turn send fibers out through the anterior root of the spinal cord to the peripheral nerves and the muscles.

The function of the motor cortex is to regulate voluntary movement. It is not known definitely whether or not this function is one of pure motor stimulation or inhibition of all the reflexes but the one desired. In the lower forms of life, such as the lizard, all the motor functions are initiated through the basal ganglia and midbrain and are relayed to the cord through the rubrospinal and reticulospinal tracts. These tracts are present in the higher vertebrates and are undoubtedly concerned with coordination and regulation of movement. The tracts form part of the extrapyramidal system in the higher vertebrates.

There are essentially three types of reflex action in the vertebrates. The first is called the lower motor neuron reflex, the reflex action being dependent upon the simple reflex arc remaining intact. The second is called the upper motor neuron. In this type, the cerebral cortex and corticospinal tract must be intact for cerebral control of motor function. A third type is through the extrapyramidal system and is largely of an involuntary nature.

Neurologic lesions must be divided into upper and lower motor neurons. A lesion interrupting the motor cortex or corticospinal tract would prevent impulses from being conveyed from the cortex to the spinal cord below the lesion and would be classified as an upper motor neuron. Such a lesion is characterized by increased reflexes and spasticity due to lack of inhibition, no reaction of degeneration because the cell of origin for the reflex arc would be intact, and by no muscular atrophy. Absence of superficial reflexes and the presence of pathologic reflexes, such as the Babinski reflex, are also characteristic of this type of lesion.

A lower motor neuron lesion, however, is one in which the simple reflex arc is broken and therefore no impulses can pass out through the spinal nerves to the muscles. In such a lesion there would be complete flaccidity of the muscles, a complete loss of all deep tendon and superficial reflexes, reaction of degeneration and muscular atrophy with complete loss of trophic supply.

Since the effects of upper and lower motor neurons are so different, the treatment must likewise be different. There can be little similarity between the management of these two types of lesions. When one is dealing with a lower motor neuron lesion, he must realize that the paralyzed parts are receiving no innervation, that the skin and its underlying tissues are deficient in trophic supply and will readily break down and ulcerate. The treatment should be of a stimulating nature and circulation should be whipped up by massage, whirlpool baths and electrotherapy. Because of the flaccidity of the muscles, splints or

braces are often necessary to hold the paralyzed members in the position of function. The treatment of paralysis due to deformity of upper motor neuron lesions must be of a soothing type. Hyperreflex excitability exists, and slight stimulation will bring about spasmodic reaction. Massage, therefore, is carried out to maintain venous and lymphatic drainage and to maintain some degree of muscular pliability. Massage must be light and soothing. Stimulating water baths and electrotherapy are contraindicated because of the intense reflex action they produce. Warm, soothing baths often aid in bringing about relaxation. Because of the muscular spasticity, the stronger groups of muscles will produce severe contractures and deformities, and to prevent this, passive movements are necessary. Splints and braces are of little use when spasticity exists. Educational therapy, such as walking machines, ladders, weaving machines and jigsaw puzzles, must be used in all types of paralysis. It not only aids in the restoration of function but also helps uninvolved muscles to take the place of permanently paralyzed muscles by supplementary movement.

SOME COMMON NEUROLOGIC LESIONS

I *Cerebral Vascular Lesions*:

Cerebral vascular lesions occur very frequently. A common site of the lesion is in the internal capsule of the brain where the fibers from the motor cortex are gathered as a band to course down the brain stem as the corticospinal tract. Such a lesion results in spastic paralysis of the opposite side of the body. There is little to be done from the medical side in such cases other than general care of the patient. Severe and painful contractures will develop in the involved arm and leg, however, if physical therapy is not instituted to prevent them. Here passive movements and light massage are of great value. Active movements should be started early and the patient should be taught to use his muscles to the best of his ability and to give himself passive movements.

II *Brain Tumors*:

Brain tumors that interrupt the motor pathways produce spastic paralysis as an upper motor neuron lesion and, as in the cerebral vascular lesions, the treatment should be prevention of contracture deformities by massage and passive movements and education of active and supplementary movements. The trophic supply of the skin should be watched in all neurologic lesions and pressure sores should be prevented by common sense care. No reddened area should be neglected regardless of how slight the discoloration. When skin has broken down, ultraviolet light in mild doses and complete and proper cleansing of the area should be the routine. All pressure should be kept off the area.

III *Spastic Paralysis*:

The term spastic paralysis is a rather loose one signifying extensive spasticity due to cerebral pathology and physiology, usually of an indefinite nature. Treatment is best directed towards education of the patient for muscular relaxation. Daily instruction in a workshop is helpful. Here he can build jigsaw puzzles and work simple contraptions where time is not important and patience is abundant. He should also be shown how to work spastic muscles passively to prevent contractures. It is extremely important that the patient be happy and cooperative if any beneficial results are to be obtained. Many patients with spastic paralysis have also a very marked athetosis in which concentration or volitional movements initiate such a marked athetoid tremor that the tremor becomes the most disabling symptom. Post mortem examination of the brain in many of these patients has revealed lesions of the basal ganglion or the phylogenetically old motor system. As before mentioned, the connections of the basal ganglion with the motor system is not definitely known but it is thought that it is through the extrapyramidal region in the anterior part of the cord. Also the physiologic effect of this system is not known in the higher vertebrates. It may be antagonistic to the little understood premotor area of the brain or the other parts of the extrapyramidal system. Certainly it is concerned with muscular coordination. In the last few years, surgical treatment has been directed to severance of the entire extrapyramidal system in the spinal cord to prevent or diminish the impulses from the premotor area which lies just ahead of the motor cortex and the frontal lobe, the basal ganglia and reticular substance, and red nucleus in the midbrain, and the vestibular muscles in the hindbrain from passing down the cord to the muscles of the body. Following this procedure, the athetosis has been described as being markedly alleviated

Such has been the experience of the author in his series of cases.

IV *Degenerative Diseases*:

Under this heading must be included such diseases as Parkinson's disease and multiple sclerosis. The physical management of patients with these diseases should be directed to promote relaxation and comfort. Stimulating therapy should not be used. The etiology of multiple sclerosis is not known and the treatment is entirely unsatisfactory. Fever therapy, by means of the diathermy unit, is quite commonly used. This comes under the heading of physical therapy but must be given with caution with careful medical observation of the patient during the treatment.

V *Spinal Cord Lesions, including Tumors and Injuries*:

Here one is dealing with upper and lower motor neuron lesions. The lesion at the site of the pathology is a lower motor lesion for that level and the muscles that are innervated by that spinal cord level should be treated by stimulating therapy as previously mentioned. The muscles below the level, however, are those of an upper motor neuron lesion and the treatment of these should be soothing, prevention of contractures and maintenance of proper vascular and lymphatic circulation by soothing massage. In spinal cord lesions there is always an imminent danger of a breakdown of the skin and tissues below the site of the lesion. The utmost care must be given to the skin to prevent trophic ulcers. The lesions following diseases of the spinal cord must be treated in accordance with the type of lesion. The spinal cord not only conveys fibers from the brain down to the peripheral nerves but also conveys sensation from the peripheral nerves to the brain. If there is a lesion of the sensory pathways, such sensation below the level of the lesion will be absent. The posterior part of the spinal cord, called the posterior column, is concerned with sensation of muscle and joint sense and, if these columns are destroyed, the patient has no knowledge of the position of the parts of the body below the lesion. Such lesions are seen in combined sclerosis which may result from pernicious anemia or from tabes dorsalis. Patients with these diseases must be taught to walk by watching their feet.

VI *Peripheral Nerve Lesions:*

Peripheral nerve lesions result in flaccidity and complete paralysis of the muscles, reaction of degeneration, loss of all reflexes, muscular atrophy and loss of trophic supply. If properly treated, peripheral nerves may regenerate but, while regeneration is taking place, severe changes may take place within the muscles of the tissues. Fibrosis of the muscles occurs rapidly after the loss of the nerve supply. It has been found that daily massaging of the muscles not only prevents some of the fibrosis but also enables the muscles to regain function after the nerve supply is again intact. When a group of muscles innervated by one nerve is paralyzed, the antagonistic muscles will overact and will produce deformities. Passive movement plus the aid of splints to hold the part in position of function is the best way to prevent these deformities. Also care of the skin should be religiously given to prevent trophic disturbances.

COMMENT

The purpose of this discussion has been to show how intimately connected the specialties of physical therapy and neurology may be. Also an attempt has been made to impress the need for a knowledge of neuro-anatomy and neurophysiology by anyone practicing physical therapy. It is impossible to go into any detail of neuro-anatomy and neurophysiology in one short article. Many well written books dealing with physical management of neurologic patients are available. Only a few brief suggestions could be included here.

Instruction in Physical Therapy in Schools of Nursing

Janet Fenimore Korngold

A review of the treatment of physical therapy as a subject for presentation to the student nurse reveals the fact that it has, over a period of some twenty-five years, been treated very much like the proverbial stepchild. Its relation to the school curriculum, to the care of the patient, to private, institutional and community nursing, has not yet been clearly defined.

For some years as far as the training school curriculum was concerned, the subject of physical therapy was almost identical with massage, and in a fairly large number of states it was customary for state boards of education or committees interested in curricula construction to incorporate a few hours of massage in the training of the student nurse. These hours usually ranged from ten in those schools meeting minimum requirements to sixteen or twenty in the more ambitious ones. In very recent years, however, there has been a growing realization that a masseuse cannot be produced in twenty hours of combined instruction and practice, and considerable dissatisfaction in the allotment of these hours to a technique which the student nurse will never, and the graduate nurse but rarely, practice has resulted in acknowledging that our attitude toward instruction in the field of physical therapy requires considerable reconstruction. The State of Illinois in its latest curriculum for accredited schools of nursing omits massage and, in fact, physical therapy of any kind from the course of study altogether, at least as a separate and independent subject.

But considering the rapid development of physical therapy and its gratifying success in the amelioration of some of our most serious diseases and conditions, it is impossible for nursing educators to permit the exclusion of the subject from the instruction and practice of student nurses. School directors, instructors, and physicians are urged to consider the 1937 revision of the Curriculum Guide for Schools of Nursing published by the National League of Nursing Education. While physical therapy as an isolated or integrated subject does not appear in the curriculum, it is apparent from a survey of those chapters presented under the titles "Introduction to Nursing Arts" and "Medical and Surgical Nursing" that the various principles and techniques of physical therapy are introduced into nursing care wherever a relationship can be demonstrated.

Under "Nursing Arts" we see that instruction is required in the purpose and technique of tub, shower, and bed baths, in the application of warmth and heat in various ways, for rest, comfort, stimulation, sedation, et cetera. Under "Nursing in Conditions of the Integumentary System," we find that the national curriculum for 1937 stresses the necessity for instruction in the care of patients receiving X-ray, radium and light therapy, as well as those being treated with the more familiar antiseptic packs, soaks and baths. Especially in "Nursing in Conditions of the Musculo-Skeletal System" is extensive instruction in physical therapy indicated in the 1937 curriculum. Nursing care involving mobilization and immobilization, special care of patients with casts, splints and fracture apparatus, understanding of traction and need for observing details of equipment related to it are incorporated in the course.

Certainly the role and responsibility of the nurse in preventing acquired deformities must be recognized in the construction of a modern curriculum. And the nursing care of patients with poliomyelitis, osteomyelitis, arthritis, and tuberculosis of bone and joint requires instruction in a vast range of techniques beginning with making and use of emergency slings and triangle bandages and including the indications for and management of radiant energy and electrotherapy.

Despite the fact that massage as an independent subject does not appear upon our state curriculum, the St. Luke's School of Nursing is still assigning this subject sixteen hours of practical instruction. The instruc-

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tion is, of course, given by a physical therapy technician from our department of physical therapy. We are glad to say that this physical therapy technician is also a graduate nurse. We feel that a technician who is also a graduate nurse, knowing from experience the character and limitations of a student nurse's services to patients, will tend to give safer, more practical and more adequate instruction than will a graduate physical therapy technician who is not a nurse.

Naturally, in her massage classes our nurse-technician does not attempt to make the student nurse a proficient masseuse. The objectives of this class in massage are clearly set forth in an article entitled "The Place of Physical Therapy in Schools of Nursing," by May Sara:[1]

"They are given just enough instruction to enable them to do their duties more acceptably to their patients. Their hands must be trained and made sufficiently supple to enable them to massage patients properly. They are taught to administer movements either to stimulate or to soothe the patient according to his needs. They are taught to use the right hand on the right side of the limb and the left hand on the left side. They must relax patients who are suffering from fractures and assist in making the numerous surgical and medical cases more comfortable. They must know when and why massage of any description is advisable or the reverse. Each student nurse must see, do and feel the different manipulations in order that she may understand just how much can be endured."

Our brief course in massage presents to our students the definition, technique and use of the four massage movements:

(1) Superficial stroking
(2) Deep stroking
(3) Kneading
(4) Friction

At all times emphasis is placed upon the fact that massage is useless, worse yet dangerous, if it is contraindicated and if the underlying principles are not followed.

In addition to the elementary course in massage our school has added within the last twelve months, six lectures on the newer forms of physical therapy. We do not claim that the course is adequate, but it is a good beginning. The outline is as follows:

(1) Lecture and demonstration on radiant energy presented to the student nurse. Infrared radiation describing the difference between long infrared from an infrared generator without light and short infrared from a luminous source. Both are demonstrated in the classroom, as are the home made electric lamp bakers made by our own mechanics for use in a patient's room or home. Details for construction are shown and indications for the application of this heat are discussed.

(2) Ultraviolet radiation is discussed, presenting the three artificial sources:

1—Carbon arc
2—Hot mercury quartz
3—Cold quartz

It is emphasized that only lights that are accepted by the Council on Physical Therapy of the American Medical Association should be used. How dosage is measured and how to test and use home lamps are other points appearing on the outline of this lecture.

(3) This lecture is devoted to hydrotherapy, special attention being given to application without special equipment or apparatus such as described in the "Handbook of Physical Therapy" published by the American Medical Association. Hydrotherapy as one of the great treatments in disorders of the mental and nervous system is stressed.

(4 and 5) Exercise, rest and hydrogymnastics are crowded into two lecture periods, although we realize that these topics deserve much more lengthy consideration and hope to do better by them during the next school year. At present hydrogymnastics or underwater exercises are presented:

1. As carried out in a large pool as at the University of Illinois, with patient and technician both in the pool.

2. Exercises in a pool 10 ft. x 20 ft. x 3½ ft. with patient in the pool and instructor outside as at the Spalding School.

3. Exercises possible in the Hubbard Tank as at St. Luke's Hospital, or in a tank such as is used by various visiting nurse associations in health centers or in the homes of patients.

In the lectures and demonstrations on exercise and rest the student nurse learns the difference between active exercise and passive or relaxed motion. She learns the indication for each of the three active exercises, assistive, free and resistive.

(6) At our concluding lecture we have shown motion pictures which can be obtained free from the Council on Physical Therapy of the American Medical Association, showing

physiologic effects of heat, cold and massage, assistive exercise by sling suspension method, and underwater exercises.

Training school administrations must bear in mind that courses of this type must be presented to student nurses only by physicians in charge of physical therapy departments or by physical therapy technicians graduated from schools approved by the American Medical Association.

I wish to make it plain that while physical therapy has disappeared from national, state and local curricula as an independent course or subject, as a correlated subject playing a part in practically all courses presented relative to nursing arts and the treatment of medical, orthopedic and mental and nervous disorders, its importance appears greater than ever, and further expansion is indicated for the future. The following recommendations are offered to school administrators, nurse instructors, physical therapists and physicians participating in the instruction of student nurses:

1. At or before the beginning of each school semester the school administration should supply all physicians, therapists and nurses who are to participate in student instruction with copies of those portions of the 1937 curriculum guide published by the National League of Nursing Education, in order that the best possible correlation of subject matter be agreed upon by representatives of medical, surgical, physical therapy and nursing departments. At least one committee meeting of those individuals concerned with the presentation of instruction should be held at the opening of each term.

2. The school director or head of the educational department, or whoever is responsible for the presentation of the course usually presented to senior student nurses under the title "Survey of the Nursing Field," should have the physician or nurse in charge of the physical therapy department or, if there be no such department in the institution, should invite such a person from another organization to address the senior students on "Physical Therapy as a Possible Field of Employment for Graduate Nurses." In such a presentation the requisites of an approved school for physical therapy technicians according to the American Medical Association must be stressed, and a list of such approved schools should be posted for the benefit of the students. Field trips or excursions under proper supervision should be made by students for purposes of interpretation to clinics, organizations, gymnasia and sanatoria offering treatments of a character impossible in smaller institutions due to inadequate equipment.

3. In every school of nursing the person responsible for the presentation of the course entitled "Introduction to Public Health Nursing" (or its equivalent) must stress the need for further development of those techniques of physical therapy which are necessary to prevent not only personal and family deterioration as a result of those diseases which cripple and handicap the individual in his social and economic activities, but social blight resulting from the incapacity of so many members to play their part in the social and industrial world. The school must establish in its instruction a correlation establishing in the mind of the student the relation of the techniques of physical therapy to public health nursing and the salvaging of damaged and incapacitated members of society, both for the sake of the individual and the social group.

4. Every school of nursing should place THE PHYSIOTHERAPY REVIEW, published bimonthly by the American Physiotherapy Association, in the school reading room where it would be available to all student nurses. It would require only a survey of the March-April 1938 issue of this publication with its splendid artice on "The Making of Arm and Hand Splints," and another on "Electropyrexia as a Treatment for Rheumatic Carditis and Other Childhood Diseases," and an excellent article on "What We Owe the Crippled Child," to convince the reader that the publication will be equally as valuable to the student nurse as, for example, THE AMERICAN JOURNAL OF NURSING, THE TRAINED NURSE AND HOSPITAL REVIEW, PUBLIC HEALTH NURSING and others.

5. It is recommended that heads of educational departments request physical therapy directors to offer lists of books on this subject for addition to school libraries as references. If a text is to be used in the course, school administrators and educational directors are reminded that the lecturers and instructors in the subject should be invited to join in a conference in a choice on the text. Two recent texts of evident merit which should prove valuable in a school intending to expand its course this

coming year are, "The Science and Art of Nursing," by Rothweiler, Coulter and Jansey, published in Philadelphia by the F. A. Davis Co., 1935, and "Physical Therapy for Nurses," by Richard Kovacs, Philadelphia: Lee and Febiger, 1936. These texts will make valuable contributions to the students' knowledge in regard to hydrotherapy, radiant energy, electrotherapy, exercise and massage.

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Physical Therapy in Schools for Crippled Children

James Warren Sever, M. D.

I have been asked to discuss the question of physical therapy in schools for crippled children. This title, then, at once leads to these questions, "What are schools for crippled children? What is physical therapy? How should it be employed? What are the necessary qualifications for those who give it?"

In order to find out how many schools for crippled children, as well as other schools and institutions treating crippled children, there are in this country, I recently sent out over 400 questionnaires. These were sent to a list of such schools, supplied to me by the International Society for Crippled Children. It was inevitable, in such a list, that there were errors—but in the main it was a fair representation. I also sent the questionnaire to the Departments of Education of the 48 states in the Union. From these latter sources, some replied giving a list of agencies in the state of such facilities as they had for the treatment or education of crippled children. It, on the whole, has been an interesting survey—not, perhaps, wholly complete, but offering many surprises. A copy of the questionnaire is offered here, so that you may know what information was desired:

1. Is your school run by private charity?
   Part of city school system?
   State controlled?
   Federal controlled?
2. Do you employ someone to give physical therapy treatments?
3. How many physical therapists do you employ?
   Whole time?
   Part time?
4. What educational requirements do you demand of your physical therapist?
5. What experience do you demand?
6. Are they graduates of schools of physical education?
7. Do you employ nurses with or without special physical therapy or orthopedic training?
8. Is the work done in a special school for crippled children alone,
   or in classes in regular public schools,
   or in the field under state or local supervision?
9. How many patients do you have to be treated daily?
   Infantiles....
   Spastics.....
   Others.....
10. How many bed or in-patients?
11. Who directs the treatment?
    Physician in charge?
    Head physical therapist?
12. Do you have a doctor or nurse in attendance?
13. Do you have a physician in charge who makes regular visits, and how often?
14. Is the institution wholly responsible for the medical and surgical care of your cases, or are the patients referred back

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Read before the Seventeenth Annual Convention of the American Physiotherapy Association, Boston, Massachusetts, June 28, 1938.

in case of need to the doctor or clinics from which they originated?

15. Do you have a treatment pool? table tub?
16. How much does the physical therapy work interfere with the academic work?
17. What is your idea of the value of physical therapy in these institutions?
18. Would you be good enough to send me a report of your institution?

Let us now consider the question of "What is a school for crippled children?" The original school for crippled children was opened in Boston, in 1894, and was called the Industrial School for Crippled and Deformed Children. This was the inspiration and work of the late Dr. Edward H. Bradford and Dr. Augustus Thorndike. Dr. Bradford felt that "we must have an institution in Boston for cripples, and I have come to believe that it ought to be a school where medical supervision, nursing, good food, and prescribed periods of rest can be given along with schooling." He very early added to his idea of schooling that there should be industrial training, as well as ordinary academic training. This is the basic idea on which any school for cripples should be founded—but in my study I found many variants. In looking over the literature in relation to cripples and cripple schools, the emphasis generally is all on academic education, and very little on physical rehabilitation as a most important concomitant factor.

As a matter of fact, in any educational program dealing with crippled children, the first factor of the greatest importance is the physical problem. At this point, then, the cripple school or institution begins to function—first, as a center of physical rehabilitation, and, second, as an institution for academic and vocational education. To my mind and experience, crippled children should be kept apart in their school life from normal children as much as possible in order that they may have the necessary individual mental attention they need and also the opportunity for the necessary medical and physical treatment.

Day schools for crippled children, as a whole, should never assume the medical or surgical responsibility for these cases but should always work in conjunction with the child's physician or the hospital from which the child comes. To do otherwise is always a source of friction and trouble. This statement, of course, does not apply to institutions such as the Shriners Hospital or other hospitals general in type, where schooling in academic instruction is given during the period of hospital care, neither of which are or could be classed as cripple schools.

To go further in my plea for real schools for cripples, may I say that most educators who have really given serious study to the problem do not feel that crippled children can be educated to good advantage alongside the children who are normal physically. The most casual observation will convince anyone that the crippled child obtains his education at an enormous disadvantage when housed with a child who can clear several steps at a single bound.

People who argue for the general education of crippled children in ordinary schools base their arguments on the fact that, inasmuch as these children will ultimately have to go to work in competition with able-bodied individuals, they should not be segregated into special classes or schools for fear they will develop a so-called cripple psychology and a feeling that they are mentally, as well as physically, different from other children. They feel that shielding them from ordinary activities of physically normal children delays their ultimate adjustment to the communities to which they are later going.

Competent authorities will in all probability agree that those whose physical condition warrants it should by all means join regular school classes, and that the special classes or schools should include only those whose disabilities are of such a serious nature as to make it advisable for special physical therapy facilities and equipment in connection with their academic training. Of course, as stated before, all crippled children should not be in special classes. There are many cripples with minor handicaps who will be able to make proper adjustments with normal children, should they be so placed; on the other hand, there are hundreds of cripples who are not physically able to compete with a group of strong, robust youngsters, and these individuals need special schools and classes.

There is one other factor in the advisability of sending children to these special classes, or to special schools, and that is the supervision which they receive there by a competent orthopedic surgeon. Fully one-half of the value these children receive as the result of attending these special schools is due to the medical supervision of their defects, the rest periods they get, the extra food, and the careful checking-up of their apparatus, plus their assured attendance at the clinics to which they are

assigned. In this way they not only keep on with their intellectual progress, but their physical needs are adequately met, which would not be the case in ordinary public schools.

The question of the difficulty alone of getting to school is a very real problem in the progress of the child, not only mental but physical. Crippled children who have to make their way in all weathers to public schools, and who, when they arrive there, have to climb flights of stairs to and from classes, are so physically exhausted that they cannot do their work satisfactorily; therefore, you will find that practically all cripple schools, and all schools having special classes for crippled children, provide properly supervised transportation for these children, picking them up in the morning near their homes and returning them at night. This obviates a good deal of physical wear and tear, makes for much better work in the school, and much better physical convalescence. This transportation, of course, is provided in the public schools by the cities and towns, and in the privately endowed institutions from their own funds, but it is most essential for the proper conduct of the school and care of the child.

The chief object in the education of seriously crippled children is to develop in them the spirit of self-reliance, with the complete abolishment of any signs of self-pity. For this reason, they feel that it is of great importance that young children should be removed from the isolated life of the home and be placed in a group of those similarly crippled. Under these conditions, if the institution in which they are placed is properly organized and furnishes the proper educational facilities and activities, they lose entirely a sense of being different from ordinary children. They are stimulated to activity and brought to a more normal intellectual point of view.

Associated, of course, with all this intellectual training in the cripple schools is the necessity for special vocational training which should not be given to young children before they have received the ordinary fundamental intellectual training.

Experience has shown that it is advisable to begin the education of the crippled child at a very early age. The training of the average cripple is necessarily long and drawn out and, therefore, should commence as early as possible. Furthermore, the things which surround the crippled child at home are not helpful to a feeling of independence, and the work of education should begin at a time when these harmful things have done the least damage.

Special schools for crippled children, apart from the very special advantages they offer, provide means by which physical rehabilitation, with the simultaneous mental training and social adjustment, may be carried out with the greatest economy and effectiveness for children of school age.

There are many schools in this country under the public school system which have their specially designated schools for the care of cripples or special departments for the care of cripples. It is becoming generally recognized that crippled children do not do so well when mixed with normal children.

This, then, after much discussion and digression, represents my ideas on what a cripple school should be and what it should offer.

Out of the over 400 questionnaires sent, there were 206 returned from 43 states or 131 cities and towns. From this data we were able to classify as follows the types of schools and institutions replying:

Classification of Schools and Institutions

Day Schools with Special Classes for Crippled Children	84
Schools for Crippled Children	9
Day Schools (Children Taken to Hospital Clinic)	2
Special Schools for Physically Handicapped	2
Schools at Sanatorium	2
Boarding School	1
Opportunity School	1
Crippled Children's Hospitals with School	12
Orthopedic Hospitals for Crippled Children	6
Shriners Hospitals for Crippled Children	2
State Hospitals for Crippled Children	6
Homes for Crippled Children	11
Convalescent Homes for Crippled Children	9
General Hospitals	14
Children's Hospitals	6
Industrial Homes for Crippled Children	3
Home for Dependent Children	1
Home for Incurables	1
American Legion Hospital	1
University Hospital for Crippled Children's Service	1
Research and Ed. Hospital, Surgical Institute	1
	175

While this is not a complete cross-section of the facilities for crippled children, it will give you a good idea of the diversified classification necessary—owing to the need in each community—and how it has been met. I still feel

that there is considerable need for standardization and centralization of effort.

In general, from the information we could glean from the questionnaires returned, we found that the following eight states reported having no public schools, special schools or classes for crippled children:

Wyoming, Utah, South Carolina, Nevada, Delaware, Idaho, Mississippi, Washington.

Mississippi reported having no school or institution for crippled children but does have a temporary clinic for the treatment of poliomyelitis cases. North Dakota reports one private crippled children's school and no facilities in public schools. Washington reported having a state statute "forbidding the use of school money for medical clinics or treatment." All orthopedic cases are sent to the State Hospital for Crippled Children, Seattle Children's Orthopedic Hospital, or to private orthopedic surgeons.

Now what is physical therapy—how should it be used—and what are the educational requirements of those who give it?

Physical therapy is first of all a curative or corrective agent and should be so used by one who understands its limitations. It is hard to define it precisely, and it should not be compared or become synonymous with apparatotherapy. Physical therapy is intended to supplement the work of the surgeon; the treatment of the medical man; and the splints of the orthopedic surgeon. This broad field of physical therapy today includes electrical modalities, hydrotherapy, radiant light and heat, massage, active and passive motion with muscle reeducation, following fractures and paralytic conditions. In other words, physical therapy is medical mechanics which in many instances degenerates into mechanical medical treatment.

The necessity of a well trained physical therapist in charge of the corrective work in schools for cripples is obvious. It was not always so. The criteria of admission of a child to a cripple school should be: what has the school to offer in the way of overcoming the child's physical handicap, making the child more able to get about, and be taught some vocational work, which, together with the improvement in his physical well being, make him more acceptable to industry and perhaps economically independent. A school for cripples which does not have this aim for a program should close.

Every orthopedic day school, a school with special classes for crippled children, and school for crippled children, should have the services of a physical therapist who should be a graduate of an approved school of physical therapy with a background of physical education or that of a graduate nurse. She should carry out her work under the direction of an orthopedic surgeon. The ideal set-up is to have one or two physical therapists in charge of the work, aided by a graduate nurse to look after the medical examinations, dressings, outbreaks of contagious disease or other medical accidents which always occur.

There has been some discussion in the literature in favor of a graduate nurse, after her physical therapy training, being a more suitable person to take charge of these crippled children. This, of course, was because of her better knowledge of medicine in general than one who had had merely a training in physical education—or that of a physical therapist. I believe that there may be something to be said on both sides, but the nurse, to be wholly acceptable, should have the physical educational and physical therapy training. A graduate nurse with only a few weeks' training in physical therapy and little subsequent experience is generally a routinist and inadequate to get the best results.

It has been suggested that a nurse with a physical therapy training is better than a physical education graduate with a subsequent physical therapy training in some positions, such as sanitariums, for medical ward patients, district nursing, industrial clinics, fever therapy clinics, and some types of private office practice. It is felt that nurses are always at a disadvantage in schools using physical therapy work because they have not the complete educational background for realizing the educational and physical possibilities and are generally more restricted to the hospital type of treatment.

Now what did we find in answer to our questionnaire?

Educational Requirements of Physical Therapists

Special training in physical therapy from recognized school	14
Graduate from recognized school of physical therapy	5
Graduate from approved school of physical therapy + 1 year's experience	5
Bachelor of Science or graduate physical therapist	2
Bachelor of Science + physical therapy course	9
Bachelor of Science + physical education + physical therapy	1
College degree + physical therapy training + 2 years' experience	1

Bachelor of Science + 1 year's experience	1
Bachelor of Science from accepted college or registered nurse + post graduate course giving certificate in physical therapy + 2 years' experience	1
Graduate nurse + physical therapy training	13
Graduate nurse or physical education + physical therapy training	4
Graduate nurse + graduate physical therapy school + registered physical therapist	1
Graduate nurse belonging to American Physiotherapy Association	1
Graduate nurse + 3 years' experience with orthopedic cases	1
Graduate registered nurse, recognized school of physical therapy, graduate of Haverstraw	1
Graduate nurse + 3-10 years' experience and special physical therapy training	1
Graduate nurse or physical education graduate	1
Nursing education only	3
Registered with American Registry of Physical Therapy Technicians	2
Member of American Physiotherapy Association	3
Member of American Physiotherapy Association + registered with American Registry of Physical Therapy Technicians	2
Standards of requirements of American Physiotherapy Association	6
Member of American Physiotherapy Association + physical therapy + special courses	2
Course in physical therapy approved by American Medical Association + 2 years' experience	2
Course in physical therapy approved by American Medical Association + 6 months' experience	1
Member of American Physiotherapy Association + physical education + 3 years' experience	1
State license, state requirements + 3 years' experience	1
Harvard Infantile Paralysis Commission course + graduate physical education	1
Harvard Course No. 445 + graduate physical education	1
Certified by U. S. Civil Service Commission as physical therapist	3
Physical education graduate	5
Physical education + 1 year's experience	7
Physical education + physical therapy training, experience not definitely given	7
Graduate physical education + experience	1
Physical education + 1 year physical therapy	2
Physical education + physical therapy + 2 or 3 years' experience in application of physical therapy and hydrotherapy procedures	1
Physical education graduate + physical therapy graduate + 1 year's experience	4
Physical therapy graduate + 1 year's experience	2
Physical therapy graduate + special experience with crippled children	3
1 year's experience	2
Certificate as health and physical education teacher + physical therapy training	1
1 year's physical therapy training or corrective physical education + 2 years' experience in physical therapy. Must meet requirements for physical education teacher in high school work	7
Graduate recognized physical therapy training school + 1 year's teaching in physical therapy + 1 year's experience in recognized hospital	1
Approved state department of education + 2 years' experience	1
Registered Federal Board of Therapy requirements	1
"We have no state supervision or regulation for physical therapy"	1
"Training in good school more important than experience"	1
"Judged by orthopedic surgeon"	1

You can see from a study of this table that the educational requirements are varied but on the whole tend to require graduation from a school of physical education or a satisfactory school of physical therapy. The necessity for experience in these types of cases is stressed but varies in time from nothing to several years. Membership in the American Physiotherapy Association is required in some cases. On the whole, the standards in general are good, and eventually with more trained people will be better.

We found that many institutions stated that physical therapy was essential and that it did not interfere unduly with the academic program. I was rather impressed to find that many schools still had class exercises, even with the spastic cases—which, to me, seems quite a waste of time for everybody. In order to make my meaning clear in relation to this latter statement, I mean that general setting-up exercises, often given between class periods, and often in groups for a short time, I believe, are of little value. In occasional cases, individual functional exercises, active and passive, are of great help. General participation of these spastic cases in games and play of all kinds are of great use, mentally and physically. Let them do what they can, as well as they can, as long as it does no harm, guiding those that need it, through functional coordinating exercises.

Speech and mental defects are such frequent factors in the cerebral cases that the real

evaluation of their response to physical training of any sort is difficult. Manual and physical skill should not be the vocational aim for these cases. In general, it may be stated that, so far as I know, no community has been able to meet the educational requirements, physical or mental, of these cases. In many of them, even the best of facilities would prove wholly inadequate because of their physical and mental defects.

Here I should like to stress the wisdom and necessity of general competitive playground work, conducted not so much by the physical therapist alone, but by the physical educationist with physical therapy training or vice versa. Basket ball, soft ball, baseball, and all the other games which normal children enjoy, can be undertaken by these children, generally without harm. The advantage of a play director with physical therapy training is of growing importance in all playground activities. Her understanding of muscle function, combined with her knowledge of individual cases, will enable her to plan even active play so that affected muscle groups may not be over-used. It has been demonstrated that unguarded active use of affected muscles in playground work has resulted in loss of power in these groups and delayed eventual recovery. I believe, therefore, that the group playground work of these patients should be carefully correlated with their individual muscular deficiencies. A film has been made of a few of the games in which the children of the Industrial School for Crippled and Deformed Children in Boston participate. Functional tests, such as those adopted by the Branch Brook School in Newark, New Jersey, can be recorded of the children's activities and are an excellent control of functional progress as a result of the physical educational effort.

In general, there are too many cases of all types assigned to each physical therapist—the average running from 10 to 98. Ten to fifteen cases to treat a day is enough, and ten is plenty, especially if there is no trained help to remove and reapply braces and other apparatus.

I believe that there is a great future for well-trained physical therapists—and this includes physical education—to take charge of the work in our cripple schools. It is a fundamental necessity, in connection with such schools, and should go hand in hand with the academic training. They should be well trained in all theories and practices of physical therapy, depending more on their heads and hands than machines. Conscientious, devoted, and with a thorough knowledge of their work, they should work hand in hand with the clinic or surgeon to rehabilitate these cripples of ours—for whom so much has so far been accomplished, and for whom so much more needs to be done.

Albrecht von Haller (1708-1777) taught anatomy, surgery, botany and chemistry at the University of Göttingen. On the basis of more than five hundred experiments he established the fact that the different organs respond differently to the same stimuli. The response may be either pain or contraction. That pain or sensibility, as Haller designated it, is the function of nerves, he demonstrated by cutting the nerves of certain organs and thus abolishing pain in the organs. Irritability is a property of muscles. It is not suppressed by resecting the nerve, since even after such an operation the muscle reacts by contraction. The theory of irritability and sensibility caused the greatest sensation and excitement in the medical world of that time. It was verified by a large number of experiments performed on animals and the correctness of the theory was debated everywhere with great ardor.—From "German Medicine" by W. Haberling.

The Application of Color Psychology in the Corrective Gymnasium

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It has been our experience in visiting gymnasiums over the country to find that in both hospital body mechanics' rooms and in college corrective gymnasiums the predominating hue is always cork brown. Many are cork brown and ivory, and some are gray. Occasionally there is a trim of one color, such as green. Who wants to have a dull brown or a drab feeling just because he is going to take some corrective exercises or do some posture work in this room? If color adds to the charm and practicability of the average room, how much more so can it be made to add to the interest and usefulness of a corrective gymnasium?

This contrast forced upon us in going from a lovely library in color or a gay school room, or even a children's ward in cheer-inspiring hues, to the plainness, the severity and the total lack of inspiration invariably found in all gymnasiums gave us the idea of creating a rainbow gymnasium which would compel the interest of every person entering and at the same time be practical for our purposes. Our gymnasium has caused much favorable comment, and we thought others might be interested in knowing how we work out this project on the psychological effect of color.

The study of color reveals interesting facts which are definitely related to our everyday lives. The psychological effect of color embodies a productive field of thought. Some colors apparently make us feel warmer, some cooler; some hues make us feel happier, some bluer.

Ketchem wrote on the strange effects of color on the human mind. He suggested the use of magenta lights concealed under the furniture at a dinner party as a scheme to make the party a perfect success. "Magenta lights have a relaxing, stabilizing effect." He cites another interesting example: "When Alonzo Stagg, football coach at Chicago, fitted out two dressing rooms in 1928—a blue one for rest and a red one for fight talks, he was using good psychology, for red is the most intense color and its vibrations are stimulating to brain and pulse."

In the Eighteenth Century blue and purple window glass was considered healthful. Blue does calm the nerves. Ketchum cities many peculiar effects of color, for example: Blackfriar's Bridge in London was formerly black, and suicides were frequent. After it was painted green, suicides decreased more than a third. Black letters on yellow paper form the greatest visibility combination, but the contrast is too strong for eyes to cope with for long periods. Properly grayed ink on yellow paper would reduce eye strain. Billiard tables covered with claret-colored cloth leave less after-image than the old green. A trend toward high value hues for submerged portions of boats is in vogue, as barnacles gather faster on dark colors than on pink, yellow, and others. A red handle sells more ten cent brushes, and an amber handle is more popular on twenty-five cent brushes.

Birren[2] suggests a yellow baseball which will stand out against the sky or any background. "It's use is expected to step up batting and fielding averages, and even pitching averages by eliminating the pitcher's unconscious feeling that his fast ball may strike the batter. If you are a bowler intent on rolling a three hundred game, have the backstop behind the pins changed from black to blue," then use orange pins. Take a look into your color surroundings, "If your office is musty brown and your secretary an advocate of midnight blue dresses, these colors are all conspiring to depress you. If you can't do

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anything else about it, fill a few shelves with red and yellow books and scatter a few summer flowers around."[4]

Waterman,[3] in her "Rhythm Book," delightfully portrays the results of interpretations of simple rhythmic patterns through the medium of colored chalks in the hands of children. Color adds to the interest of the creative activity. A sweet elderly lady friend tells us that she notices quite a marked difference in her unconscious reactions to working with her colored silk quilt pieces. A day with reds and oranges makes her jittery, while the same amount of time spent on blues and greens is very restful.

More people respond to advertising mail on light green, red or yellow paper than on white paper. The cafeteria of a factory in New York was decorated in light blue. The women complained of being cold and wore their coats. The thermostat said that the temperature was the same there as all over the factory. The decorator returned and added orange baseboards and orange slip covers for the chairs. The complaints of chilliness ceased. According to Grant Allen there is no element in our sensuous nature which yields us greater or a more varied pleasure than the perception of color.

It would be ideal if we could plan our color harmonies for our patients. We hope some day to have rooms of restful orchid, blue, and green for spastic children; and rooms in cheerful yellows with splashes of orange and red to perk up the despondent arthritics or infantile paralysis cases. Irving[4] states that hospitals dealing with mental cases are beginning to give thought to color. "Depressed or suicidally disposed cases are hustled into rooms with yellow or orange or red walls. If the patient is mildly depressed, the yellow will give him a lift; if he has a humdinger of a depression, 1933 type, red supplies the maximum stimulus. . . . On the other hand, overexcited and overstimulated patients are ushered into rooms finished in green, blue, and cool grey. If only a mild color sedative is needed blue-green walls will do nicely; but a really excited patient may need exposure to solid violet."

Investigation has revealed the fact that the radiation from a light source, such as the sun, consists of disturbances of various wave lengths in the ether, some of which, upon striking the retina of the eye, are capable of arousing the sensation of color, depending upon the wave length of the frequency of the vibration. The shortest visible wave lengths are the violet; the longest visible wave lengths are the red. Intermediate wave lengths, from the shorter to the longer, produce respectively the sensations of blue, green, yellow, and orange. Light rays are decomposed by a prism or by defraction grating into colored rays—the eye is not an analytical instrument but a synthetical one. For example, white light is the integral effect of radiation of many wave lengths of daylight, or in special cases is the combined effect of many wave lengths. Another example is the sensation of yellow which can be caused in three ways: first, by a certain wave length in the spectrum; second, by a mixture of green and red lights of proper intensities; and third, by the integral effects of various wave lengths such as are commonly reflected by yellow pigments, in which cases the wave length exciting the sensation of yellow predominates. These three ways of producing the sensation of yellow are only general classifications. "Two distinct kinds of color terminology are necessary to meet all requirements; the science of color requires a terminology and notation based on the spectral characteristics of colors because spectral analysis is of fundamental importance."[5] From our viewpoint, however, we are concerned with what the eye sees, so that the actual spectral characteristics will not be considered here. In everyday words there are two interpretations of color which we are apt to confuse: first, the science of light combinations; and second, the science of reflected colors or pigment combinations.

If a beam of light passes through a slit and falls on a prism, the white light is diffused into the rainbow colors. This band is the spectrum and these colors are spectral colors or light. When pigments or various paints, dyes, et cetera, are mixed, we are concerning ourselves with a different process and get different results. "When pigments are mixed, each one subtracts certain colors from white light; and the color of the mixture is the color which escaped absorption by the mixture of the different ingredients."[6] In other words, the color we see is what is reflected. "Blackness is due to zero stimulation."[7]

Complementary colors as used in design and art are different from complementary colors as used in the spectrum or physics. The physicist is concerned with color sensation; the colors mix in the eye of the beholder. The artists uses color pigments. The pig-

ments when mixed convey only one sensation. These views do not conflict but each is a different approach to color study.

An incorrect use of color harmony may offend more quickly than any other element of design. Colors may be harmonized by using slight contrasts; or, again, if there are many colors to be used, one color may bind them all together by carrying a tinge of this one hue through all hues. Harmony may be due to a sort of repetition. "It can be concluded that color nomenclature usually begins with red and progresses toward the blue end of the spectrum. In the early stages of its evolution the transitional colors such as orange, blue-green, and violet are passed by. Nearly all languages have a name for yellow; but comparatively few have a conventional word for green and fewer have one for blue."[5] "From the earliest times, man has thought of colors as symbols, and has associated them with emotions and thoughts."[1] Primitive man preferred gaudy brilliant colors. Intellectuals prefer tints and shades (modified colors). One author has said that no more definite statement can be made than that children are impressed with striking colors and that brightness and novelty are important factors. Experimental data obtained by different methods with children of ages ranging from three months to two years do not agree, but the general conclusion is that among all colors red is the more striking to the child than blue and is named correctly at a very early age.

Colors containing red are known as warm colors. Colors with blue predominating are called cool colors. The warmth or coolness of a single hue can change its emotional appeal; for example, a blue-green (cool green) conveys a feeling of sophistication and aloofness while a yellow green (warm green) gives a feeling of melancholy or illness. Physics bears out the fact that red is warm because the heat rays are actually the infrared rays. Color symbols are interesting:

Violet-red (cool red)—means passion, rage, blood, royalty, tragedy, carnage, pomposity, anger, and war.

Orange-red (warm red)—means health, action, fire, heat, power, courage, heroism, and strength.

Orange (warm)—means warmth, courage, harvest.

Orange-yellow (warm) — glowing, lively, warmth.

Yellow (warm)—Cheerfulness, gaiety, merriment, happiness, lightness, warmth, prosperity, fruition, and gaudiness.

Yellow-green (warm) — distrust, deceit, cowardice, morbidity, sickness, and billiousness.

Green (cool)—Peaceful, coolness, youth, spring, immortality, hope.

Blue-green (cool)—Sophistication, coolness, aloofness, faith.

Blue (cold)—Tranquility, truth, coldness, dignity, sedateness, fidelity, constancy, generosity.

Blue-violet (cool)—sternness, unyielding, gloom, suffering.

Violet (cool)—Quieting, mystery, subduing, melancholy, stately, religious, impressive, royalty.

These hues carry us around the color wheel. In the above order they carry us from one neighboring color to the next with as little jump as possible.

Combining adjacent or near hues would make up an analogous harmony or relationship. Placing hues that are naturally farthest away from each other on the color wheel would create a complementary color scheme of contrasts and accents. The complementary colors have no common element and, therefore, are opposed and are difficult to harmonize unless some common bond is introduced. For example, if pure red and pure green complements are put side by side, they force each other. The red looks redder and the green looks greener. They have no common bond to tie them together. Dobbie[8] reports experiments with school children on color combinations showing that "in multiple combinations of colors, the juxtaposition of similar hues (small intervals) is decidedly preferred to that of complementary colors (maximal intervals)." Cool colors are more restful but may be either agreeable or disagreeable due to association or appropriateness.

Children prefer pure colors to tints or shades of colors. Intense colors in general are preferred in small areas. A small spot of intense color will balance larger areas of more grayed colors. A contrast both in color and in brightness or intensity of color is very important in the matter of attracting attention. Few people are conscious of color unless there is a striking contrast or else the colors occupy extensive areas.

Warm colors apparently advance to meet you. For example, red seems to vibrate and move toward you. Cool colors recede, add

depth and make good background colors. It is true, therefore, that large areas of blue, blue-green, or green would be pleasing, restful, quieting, and make good backgrounds; while smaller areas of yellow, orange, or red would give accent, advance to meet you, and would add gaiety, stimulation and interest.

We are beginning to recognize the facts of the psychological effects of color and plan our surroundings accordingly. Berrin[9] says, "Mood conditioning is coming into vogue in room illumination. Blue-green is now common in hospital operating rooms; it rests the surgeon's eyes and makes him a few jots surer of the knife. . . . An insane asylum in Illinois uses red to perk up cases of melancholia, while blue has good results on neurotics. . . . In the new color movies blue and red, foremost of the sensation colors, are going to make you feel the way the director wants you to feel."

Now let us get back to that project of the gymnasium in rainbow hues. According to the color theories just discussed, we had many possibilities; and we tried them out. First of all we decided to keep most of the color on the cool, or background, side and to use the warmest and most stimulating color only for accent or for some particular goal. We now have, therefore, a large table in blue-*green* hue for examining purposes. The mirror base and the greater part of a large cabinet of drawers are blue-*green* also. The next largest area was painted green-*blue*. The massage table, bench, and supinator walking boards are all in this hue. One or two small pieces of equipment, such as stools and scales, added a note of cheerfulness and lightness when painted in the quick drying enamel of yellow and yellow-orange. Just an accent of red finished the color scheme, with this hue being used as a definite objective or a definite goal of achievement. By "goal" I mean just that. Our stall bars may be used as a classical example of color as an objective. The lowest bar is green-*blue*, next is blue-*green*, then yellow and orange. This rhythm is repeated. As the child climbs to the top, he finally completes the cycle leading toward red until the top bar is reached and this last one, his ultimate goal, is red.

We have small hurdles to train the child to lift the foot and flex the knee and hip high to step over without tipping the bar off. These hurdles complete the color harmony employed in the room and the red one is again placed at the end as a goal of endeavor. We find that the children are really enthusiastic about this equipment. A handicapped child remembers that yesterday he could climb only to the second yellow one but today he reached the orange one, and tomorrow he can surely reach the one coveted red bar at the top. The color is undoubtedly a valuable stimulus.

The walls of our room are of ivory because white "reflects all the qualities of light—the bad and the good—and breaks down the nerves on the retina far more rapidly than the yellow or the ivory."[9] Around the walls of this room is the parade of colored corrective silhouettes which Richardson and Hearne used in black in the frontis-piece of their book "Posture of the Pre-school Child." Our silhouettes add rhythm and harmony, by repeating the color scheme, in addition to their value as examples of corrective exercises. The largest figure, the band master, is green-blue. Next the tall giraffe at the other end of the "mural" is blue-green. Between them you find the elephant walk, and the mule kick in yellow and orange, while the tiny duck walk adds the accent of interest in red. The toys on the shelves repeat for the most part these colors named. Our window drapes are of unbleached domestic material with half-inch bias fold bands of the rainbow colors at the bottom. We have employed an analogous harmony (neighboring hues) of close intervals as we progress up the bars or along the hurdles since children presumably prefer colors of closer intervals.

More of our children are handicapped by infantile paralysis or by spastic paralysis than by any other two disabilities. We need very little apparatus for muscle training in infantile paralysis cases and colorful surroundings add to the interest of exercises. The spastic children need training in relaxation and coordination, but it must be achieved in an indirect manner or else they will become more spastic in trying hard to move the muscles. We believe, therefore, that the use of large areas of cool colors helps to quiet them and at the same time that their interest is taken away from their spastic muscles. Only a small amount of the stimulating red is used to define the objective. This intrigues the child and he is happy in carrying out his training in an indirect manner far more valuable and more productive of results than any series of exercises given in a dull room would do. It has been most instructive to note the interest displayed in these colors by the patients during the year and a half we have had

our gymnasium. There is no doubt that it has been a worthwhile experiment. The children love it, and the adults show by their faces or comments their surprise and approval on entering the door.

Recently we conducted a little experiment on color appreciation. Our newest acquisition has been a cabinet for small equipment, games, toy orchestra, and such. The greater part is blue-green, while the upper part is divided into glassed-in display cases for display of articles made by the children in occupational therapy. While the main part of the cabinet is blue-green, the interior of the display cases across the top are yellow, orange, red, and blue respectively. We have asked each child and adult who sees this for the first time whether or not he likes it; if he answers "yes," we ask which of the five colors he prefers. We have found that many adults like it for its appeal to children but would consider it a little bizarre for themselves. This is a natural reaction. All children think it very beautiful. Adults in nearly every instance prefer the blue-green or the yellow. Practically every child has preferred the orange or the red.

This again seems to check with the data of those who have experimented with color. There seems to be no difference as to color preferences between the spastic children and the other children, although it might seem that the overstimulated spastic child would unconsciously prefer blues and greens.

When we finished with our body mechanics room, and as we passed by the exercise pool, the "color bug bit us again." Now the water softly reflects the blue-green and yellow of the wooden leg-splints and body-floats. Next we fixed the outdoor gymnasium which is now as gay with color as a hillside of wild flowers. Here there are different height stairsteps for training spastic children, with the lowest steps green and blue. Only the one at the top is red. Here is the climbing ladder by the swings. Instead of a pot of gold at the foot of this rainbow, there is a carmine signal of achievement for the child who reaches the goal at the top.

"This is the Age of Color! We, the West
In oriental brightnesses are drest!
Not puritan but pagan,—everything
Indoors and out wears bravest coloring."[15]

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ELECTROTHERAPY. Scientific electrotherapy was introduced by *Remak* (1815-1865) in 1855, and *Hugo von Ziemssen* (b. 1829), the great encyclopedist, in 1857. It reached its most popular stage in the seventies and eighties of the last century, largely through the efforts of *Wilhelm Erb* of Heidelberg.

The use of diathermy in treatment was started by *R. von Zeyneck*, who in 1898 in the laboratory of Nernst noticed the heat production of Tesla's high frequency current.—From "German Medicine" by W. Haberling.

Some Practical Suggestions Concerning Foot Exercise Based on Dr. D. J. Morton's Book "The Human Foot"

Catherine A. Worthingham

Doctor Morton, although he belittles the part exercise may take in foot correction, points the way to a more rational approach to foot exercise. His objections are to the further development of strength in the invertors of the foot and to the exercises designated to create a metatarsal arch. The invertors are often greatly hypertrophied in structurally poor feet and the existence of a metatarsal arch has been disproved experimentally by Doctor Morton, as he has found that the weight is distributed over all the metatarsal heads.

The following five significant points in relation to the use of the lower extremity are made by Morton: (1) structural stability; (2) postural stability; (3) digital action; (4) balance and leverage axes; and (5) angle of gait.

By structural stability is meant the stability inherent in the foot itself. The bones and ligaments of the foot are so cleverly designed that the foot forms a rigid base for support. The weight-bearing areas are the heel and all the metatarsal heads, and to a slight extent the toes. There is no metatarsal arch, except in the midtarsal region. The longitudinal arch is considered as longitudinal sections from the heel to each metatarsal head. This structural stability is present even in the unconscious person.

Postural stability is in the subtalar joint and is controlled by the normal tonicity of the invertor and evertor muscles. The talus plays a double role here. It acts as a bone of the foot in plantar and dorsiflexion, the tibia and fibula gripping it laterally as they move forward and backward over its superior articulating surface. In supination and pronation it acts as a bone of the leg. In these movements the tibia and fibula grip the talus firmly and the movement is in the subtalar joint. It is evident, therefore, that anterior-posterior stability is greater than lateral stability. It is not the strength of the lateral muscles but rather the balance between the opposing groups that is important.

By digital action is meant the gripping power of the toes. It is strong digital action that gives spring and elasticity to the foot.

The balance axis of the foot is from the center of the heel to between the second and third metatarsal heads. The leverage axis is from the center of the heel to between the first and second metatarsal heads. The balance axis is used in standing and in the gravitational portion of the walking step. When the propulsive portion of the step is reached, the axis swings into the leverage axis. The leverage axis is used in running.

Doctor Morton presents quite a different point of view in discussing angle of gait from that which has been generally accepted. He bases his conclusions on his own studies of African natives and studies made on men and women students at Stanford University under the direction of Doctor A. Meyer. He concludes that a forty degree angle between the feet is correct for the standing position. Fifteen to twenty degrees between the feet is the natural walking angle and the feet tend to approach the parallel position in running. A little experiment, for those to whom the idea of giving up the parallel foot position is a shock, will show the reason for this change. Stand with the feet absolutely parallel, then step forward maintaining the parallel position. It will be noticed at once that it is difficult if not impossible to start the transfer of weight from all five metatarsal heads. There are six weight-bearing areas across the metatarsal heads as the flexor tendon of the great toe provides two sesamoids. The medial three weight-bearing areas (the two sesamoids and the metatarsal head of the second toe) take most of the strain. Now stand with the feet at a fifteen to twenty degree angle and it will be found that the weight

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can be transferred evenly through all the metatarsal weight-bearing areas in the gravitational portion of the step. During the propulsive stage the leverage axis is used.

The myth of a parallel foot position in walking seems to have arisen from two sources. First, the Indian is reported to have made parallel foot prints, but the error in interpretation probably arose from the fact that it was the foot prints of the Indian runner that were observed. Second, Doctor Goldthwaite, at the time of the great war, suggested that an in-toe position might help to strengthen the feet of the soldiers. The angle of gait is controlled by the rotator muscles of the hip and the postural stability of the foot principally by the invertors and evertors of the foot; consequently foot exercises suggested in this paper are planned to develop the kinesthetic feel of correct balance between the muscle groups involved. The entire emphasis is on the correct use of the feet rather than on exercises without weight bearing to develop muscular strength.

It is not the purpose of this paper to describe structural faults of the foot, but the following points made by Doctor Morton are significant and a complete discussion of them will be found in his book.

1. The collapse of the foot starts from a minor fault.

2. The disastrous results are not from lack of muscular strength, but from the exaggeration and extension of the original fault under stresses which ordinarily would be normal.

3. An extreme defect will not cause symptoms if the activities of the individual are comparatively negative.

Among common structural faults of the foot is listed the short first metatarsal. Morton's discussion of this fault and its implications for stability are of interest to all who attempt to teach the correct use of the foot.

SUGGESTED TECHNIQUES BASED ON THE FOREGOING DISCUSSION

Walking—Fifteen to twenty degree angle between the feet.

1. Heel, toes spread.

The weight is placed gently on the entire heel (avoid tendency to pound heels). Then the metatarsal heads and toes are pressed down firmly, starting with the little toe. The object of this exercise is to secure flexibility and the ability to localize the feeling of pressure on the respective metatarsal heads.

2. Heel, arch, toes.

The weight is placed on the entire heel, the outer border of the foot is next placed, without pressure, on the floor and then all the metatarsal heads and toes are pressed down firmly. Care must be taken that the inner border of the foot does not sag after the transference of weight is complete.

3. Toe, ball, heel.

The toes are pressed down firmly, then all five metatarsal heads and lastly the heel. This exercise should give the feel of pressure on the toes.

4. Heel, toe—rapid.

Very short, rapid steps are taken. This is planned for flexibility and the accurate transfer of weight from heel to all five metatarsal heads. The soft use of the feet is emphasized to avoid all danger of heel pounding.

5. Toe, heel—rapid.

Merely the reverse of the preceding. Its chief value lies in accurate localization of pressures.

6. Push-off, walk.

Using the same walk as in Exercise 2 place the emphasis on a strong digital push.

7. Walking sideways.

Step to the side, step back, step side, step forward. The weight is automatically thrown toward the outer borders of the feet, but the teaching emphasis is placed on keeping the pelvis facing straight ahead with relaxed hips and knees, together with strong pressure on the toes and all five metatarsal heads.

Standing—Thirty to forty degree angle between the feet.

1. Stride standing position, knee bending.

Grip the floor tightly with toes and heels; maintain the outer borders of the feet in contact with the floor but do not press on them. Hold this position of the feet. Push the hips forward and bounce, emphasizing outward rotation at the hip joint as the knees bend. Avoid pushing on the inner borders of the feet.

2. Same position as in No. 1.

Maintain the trunk in an upright position and take particular care to control the position of the lower spine. Flex the right knee and then the left, using a swinging motion. Be sure that both feet remain in contact with the floor as in No. 1. Do not push on the inner border of the feet.

The two preceding techniques are designed to make use of the peronaeus longus muscle in its function as a depressor of the first meta-

tarsal and a brace for the inner longitudinal arch.

3. Same position with a wider stride.

Bend the right knee and force the right hip to the side. This results in a stretch of the adductor group of the left thigh, providing both feet remain in contact with the floor in the position described in No. 1. Swing from one hip to the other.

4. Same position as No. 1.

Swing from the left foot to the right with a final strong push from the great toe and second toe, allowing the heel, of course, to leave the floor. The purpose is to develop strong digital action.

Relaxation of Hip and Leg Muscles.

1. Using a 15-20 degree angle between the feet.

Keep the right leg and hip muscles perfectly relaxed. Lift the right lower extremity with the side abdominal and spinal muscles. Do not elevate the shoulders. Progress forward, using alternate feet. Lift, step; lift, step, etc. Care must be taken to place the foot down correctly for weight bearing at each step.

Running—Feet approach the parallel position.

1. Use feet very softly, short steps. Heels touch floor with each step.

2. Run with a short stride—toes taking the weight momentarily, then the ball and heel. There is a tendency to lift the toes and land on the ball of the feet in many persons with poor mechanical use of the feet. Controlled relaxation of hip, knee and ankle are essential.

Skipping—Feet approach the parallel position.

1. Emphasize the soft use of the feet. Touch the heels momentarily with each skip.

2. Skip backward.

Insist on the heels touching each time. This is very good for developing flexibility in the ankle and teaching proper contraction and relaxation of the gastrocnemius-soleus group.

3. Skip and turn.

Make a half-turn with each skip, progressing forward. Use the feet in the same manner as in No. 1 and No. 2.

Sliding—15-20 degree angle between the feet.

1. Slide sideways, maintaining extension of the body and relaxed shoulders. Touch heels to floor with each slide.

Galloping.

Maintain extension of the body with relaxation of the shoulders. Emphasize the lift of the forward knee and the controlled relaxation of hips, knees and ankles. Touch heels of both feet to the floor.

In running, skipping, sliding and galloping the use of the heel is important. To secure the full spring from the foot it is essential that the heel act as a cushion and a starting point for the next elevation.

Throughout the foregoing techniques the writer has purposely avoided all exercises without weight bearing, feeling that the problem of foot correction is one of the proper kinesthetic feel of the correct position. This necessarily involves a balance of pull of antagonistic muscle groups rather than the development of strength in a few selected muscles.

PHYSICAL AND DIETETIC THERAPY. German physicians contributed also to the progress of physical and dietetic therapy. Thus in 1882 *M. J. Oertel* introduced the treatment of obesity and of cardiac disturbances by special diets and his so-called *Terrainkur* (exercise in specially selected terrain hills); *Hermann Brehmer* became one of the founders of the modern sanatorium treatment of tuberculosis (1854); *Schreber* introduced into Germany in the fifties treatment by medical gymnastics.—From "German Medicine" by W. Haberling.

Physical Therapy in the Treatment of Fractures

Frank D. Dickson, M. D.

Widespread mechanization of industry, the increase in the employment of machinery in agriculture and the tremendous growth in the use of the automobile have completely changed the fracture picture in the United States in recent years. This change has been in two respects: (1) There has been a great increase in the number of fractures which occur annually; (2) there has been a marked increase in the number of serious fractures. The increase in the number of fractures is traceable to the greater opportunity for suffering trauma likely to cause fracture; the increase in the number of severe fractures is ascribable to the severe damage which results from the type of violence which machinery inflicts. As a consequence of these factors, the fracture problem today must be considered as having two aspects: a medical aspect which includes the recognition, reduction and immobilization of fractures, and an economic aspect which includes the length of time consumed in recovery, as measured by the period over which the individual is disabled or restricted in activity, and the final result, as measured by permanent residual disability. The effectiveness of fracture treatment today, then, cannot be based solely on securing union of the fractured bone or bones, for the rapidity with which the individual is returned to work and the extent to which function is restored must also be taken into consideration. Formerly, treatment of a fracture consisted in applying a splint and leaving it to nature to complete the cure; today, when we are dealing with more serious and more complicated fractures than in the past, a successful end result is dependent not only on adequate immediate treatment of the fracture but also on carefully planned and supervised after-care. Both of these requisites are necessary to meet the demands which the management of fractures today make on those who aspire to treat them and secure end results which will meet the critical judgment of public opinion and compensation commissions.

As this contribution deals with physical therapy as applied to fracture treatment, the immediate treatment of fractures may be briefly dismissed. It should suffice to say that at the present time it is generally conceded that a fracture should be treated as surgical emergency and reduction under an anesthetic, local or general, carried out at the earliest possible moment and adequate fixation immediately applied. The reasons for this position are quite evident: immediate reduction minimizes local trauma and so cuts down the amount of traumatic exudate and infiltrate which accompanies any injury; it reduces to a minimum the undesirable muscle spasm always present; it favors the early reestablishment of blood and lymph circulation so important to healing. Following reduction, adequate splinting is necessary to insure continued maintenance of reduction and preservation of the conditions which make for rapid and complete healing.

The proper after-care of a fracture in the main consists of maintaining fixation of the fractured bone or bones until union has occurred, the early restoration of normal circulatory efficiency in the involved region and the building up of muscle tone and power so that normal use may be resumed at the earliest possible moment. Physical therapy, properly and intelligently employed, can be of inestimable service in this period of after-care in hastening recovery, but it is equally true that if physical therapy is used as a part of a routine without a true understanding of its purpose it may be a detriment rather than a help and even actually prolong the period of convalescence by inculcating in the patient a belief that recovery is to be attained by physical therapy alone and without effort on his part.

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In order that physical therapy may be intelligently used in the treatment of fractures, it is necessary that its purposes and aims be clearly defined and recognized. Briefly stated, these are (1) promoting the early absorption of hemorrhage and traumatic exudate; (2) relaxation of muscle spasm to relieve pain and discomfort; (3) the reestablishment of normal circulatory conditions in the affected extremity, blood stream and lymphatics, which insures a more rapid and complete healing of the fracture; (4) building up in the muscles of the extremity that tone and flexibility so necessary to normal use. These effects, as has been emphasized by Clay Ray Murray,[1] are brought about by physical agents acting on the neuromuscular and neurovascular reflex mechanisms and through the stimulation of muscles by physical means or voluntary action.

Broadly speaking, there are four basic forms of physical therapy which may be employed in the treatment of fractures to accomplish the purposes catalogued; they are heat, massage, exercise and muscle stimulation. The first two of these secure their effect by bringing about muscular and vascular relaxation; the third and fourth are of chief importance in promoting venous and lymphatic flow and preparing the muscles to resume their normal active role as soon as use may be safely permitted.

HEAT

Heat as a physical agent may be applied in a number of ways such as by a therapeutic lamp, diathermy, electric pad and as radiant heat by the use of ordinary light bulbs set up in a cradle. Heat, to bring about the best results, should be employed at low intensity and over a considerable period. The most important effects secured from heat are analgesia, relaxation of muscles, relief of spasm and vasodilatation, and the longer these effects are maintained within reason the more productive they are. Heat of high intensity which produces a marked erythema cannot be tolerated long and is decidedly less beneficial.

MASSAGE

Massage has been described as the scientific manipulation of the soft tissues of the living body for therapeutic purposes. Massage is effective when applied by a trained person in a scientific manner; there is a vast difference between the skilled manipulation of a trained physical therapist and the rough and ready methods of the Turkish bath attendant or gymnasium rubber. Properly given, massage stimulates the nerve endings and activates sensory impulses of a wide variety which are important in relaxing muscular and vascular spasm and relieving pain and discomfort. It also promotes the absorption of hemorrhage and exudate by improving blood and lymphatic circulation in a damaged extremity. The type of massage most useful in the treatment of fractures is light stroking massage; the movement should be slow, even, steady and always in the same direction; that is, lengthwise of the part in the direction of venous circulation. It should be remembered that massage employed to get rid of hemorrhage and exudate and reduce swelling acts by bringing about improved circulatory conditions and does not rub the exudate out of the part by pressure and force. Although all authorities do not agree, it is my opinion that light and very gentle kneading may also be used to advantage in fracture cases; such movements stimulate the intramuscular circulation and improve muscle tone.

MUSCLE STIMULATION

Muscle contractions may be produced by voluntary effort or by electrical stimulation. Voluntary contraction of muscle groups is incomparably superior to any form of artificial stimulation. Unfortunately, however, it is possible to utilize voluntary muscular activity in the treatment of fractures only to a limited extent until union is sufficiently strong. A very useful amount of voluntary contraction can usually safely be permitted and encouraged in most fractures earlier than is generally recognized under proper conditions of immobilization. Such limited voluntary use is made possible by employing fixation (traction or hinged splints) which holds the fractured bone or bones securely but permits the guarded use of adjacent joints, by the use of molded plaster splints instead of circular plaster dressings and also by having the patient "set" the muscles of the injured extremity a number of times each day; such "setting" of the muscles can be carried out even when the limb is completely encased in a plaster dressing. The extent to which muscle tone and flexibility can be maintained by carefully supervised daily exercise under proper conditions of fixation is often surprising.

Muscle stimulation by electrical stimulation,

while not as satisfactory as active exercise, is nevertheless a useful therapeutic aid for maintaining muscle tone. Pemberton[2] has shown that whereas lactic acid is produced by contraction of muscles following volitional effort it does not arise at least in significant amounts as the result of stimulation of the muscle by faradic current. It is therefore probable that no form of electrical stimulation can be expected to produce the same type of muscle contraction as that which results from voluntary use. To avoid painful contraction some form of sinusoidal current may be used. The Council on Physical Therapy will furnish a design for making a faradic sinusoidal coil. This coil produces a sinusoidal current which will give graduated muscular contraction as described by Bristow and Smart. The value of these contractions is primarily the increase in circulation in the muscle. When electrical stimulation is utilized to bring about muscle contraction, it should be painless and not cause muscle spasm; for, when pain and spasm are produced, harm rather than good results.

Of equal importance with the measures used for applying physical therapy is their use at the proper time. Too often physical therapy is looked on as the final step in fracture treatment, as an agent to be used to restore function to atrophied muscles and stiffened joints which have been rigidly immobilized for weeks in a fixation dressing. While occasionally fractures are encountered in which the application of physical therapy is impossible until union is complete, to wait so long in the vast majority is losing valuable time and unduly prolonging convalescence. Theoretically, physical therapy may be used advantageously in all three stages into which fracture treatment is divided, the reduction period, the postreduction period, and in after-treatment.

THE REDUCTION PERIOD

While unquestionably massage and elevation may be used with advantage to reduce swelling and quiet muscle spasm preceding reduction and the application of definitive splinting, to carry out such measures in a routine way demands a special setup and personnel which is rarely available. Practically, then, physical therapy can play but a minor role in the reduction period. However, when for any reason it is impossible to proceed with the immediate reduction of a fracture, even if the delay is but a few hours, heat and gentle massage may be used to advantage. When fractures are accompanied by severe trauma to the surrounding soft parts with extensive hemorrhage, and reduction, open or closed, must be delayed for several days, heat and massage may be used with considerable benefit to improve the condition of the soft parts and permit the application of definitive treatment much sooner than would otherwise be possible.

THE POSTREDUCTION PERIOD

In the postreduction period physical therapy should assume a very important role in fracture treatment, but unfortunately it is during this period that it is most neglected. It is in the immediate postreduction period that exudate and hemorrhage which will become organized into scar tissue about the muscles, tendons, vessels and nerves and interfere with muscle action, normal circulation and joint movement can largely be removed by restoring as early as possible normal circulatory efficiency to the part. The stiffness, soreness and impaired function following a fracture are due in large part to such scar tissue and its removal or at least reduction to a minimum lessens the discomfort incident to restoring function and materially shortens the period of convalescence. Furthermore, in the light of recent investigations, clinical and experimental, it seems clearly established that delayed union and nonunion are in the main traceable to interference with circulation at the fracture site so that early restoration of circulatory efficiency is our best safeguard against these catastrophies.

It is quite true that the application of physical therapy at this time is often difficult because the part is encased in a fixation dressing, but by the use in both bed and ambulatory cases of traction, which allows ready access to the part for physical therapy, through apertures in plaster dressings, by the use of hinged splints which allow movement in adjacent joints without disturbance of the fracture site, by the use of open splinting and by daily "setting" of the muscles, it is usually possible in most fractures to use heat, massage and muscle contraction throughout the period of fixation to the great advantage of the patient. So-called open splinting has in recent years been used more and more in the fixation of fractures; this permits the employment of physical therapy to a very satisfactory extent. By open splinting is meant using anterior or posterior or lateral molded plaster splints to replace circular plaster dressings

when possible; as, for example, in Colles fractures, fracture of the patella and fractures of the ankle. Such splints afford ample exposure for physical therapy without disturbing the fracture. If a circular plaster dressing is used, it may be bivalved and the halves removed alternately for the application of physical therapy.

In addition to "setting" muscles in this postreduction period, active muscle contraction may be encouraged in several ways. Even with the forearm and arm encased in a plaster cast, if the fingers are free, the patient by squeezing and relaxing the grip on a rubber sponge can exercise the forearm and arm muscles extensively. Under the same conditions the shoulder and arm muscles will retain a large part of their tone and power if the shoulder joint is exercised regularly each day instead of holding the arm continually suspended and immovable in a sling. In Colles fracture, too often the elbow and shoulder joints are not moved and exercised, with the result that atrophy of the arm and shoulder muscles and limitation of movement in the elbow and shoulder joints prolong recovery while these avoidable conditions are being corrected. In leg fractures, systematic knee and hip exercises should be carried out each day to maintain muscle tone and strength in the thigh and hip muscles so that the extremity will be better prepared to function when weight bearing is permitted. In these ways and others which naturally suggest themselves, muscles and joints may be kept active and the general strength of an extremity maintained in a state of reasonable efficiency.

THE PERIOD OF AFTER-TREATMENT

It is in the period of after-care that physical therapy is most generally used in fracture treatment. It is unfortunate that it is so frequently improperly used. The objective sought for in the after-care of a fracture is the restoration of normal use to the injured part after union of the fracture is complete and splints and restraints have been removed. The restoration of the ability to use the damaged limb normally or at least satisfactorily is possible only when muscles are active and joints movable. Muscle tone, flexibility and power can be built up only by progressively increasing active use of the muscles by the patient; a joint stiff or with limited motion can become movable and reasonably useful only through the establishment of muscular control of the joint by the patient. It should be clearly understood that the range of passive movement which can be obtained in a joint is no criterion of its usability, since only that degree of movement which the patient can control is usable. Furthermore, until voluntary control of joint motion is established, ankylosis or serious impairment of the range of joint motion of a more or less permanent character is possible. The role of physical therapy in the after-treatment of fractures may be stated then to be helping the patient to regain voluntary use of the muscles and voluntary control of impaired joints of the injured extremity. Heat, massage and muscle stimulation can reduce swelling, can decrease pain, soreness and stiffness in weak and degenerated muscles, can improve vascular and lymphatic circulation, can stimulate neuromuscular and neurovascular impulses, can in brief make it easier for the patient to use the impaired part and build up voluntary control, but they cannot make him well. The patient, in the last analysis, is master of his fate, and physical therapy is but the tool which enables him to carve out his recovery with the least discomfort, the greatest speed and to the fullest extent.

In seeking to help a patient to regain voluntary control of the muscles and joints following a fracture, heat and massage should be used to loosen up and render more pliable muscles and so reduce the stiffness and pain incident to attempts at movement. The movements which are used should be designed to bring about normal action of the joint in the most natural manner. Having the patient go through the motions of brushing the hair in elbow fractures, driving nails with a light hammer in fractures of the wrist, turning a door handle in fractures of the forearm, and reaching for objects placed at a gradually increased height in shoulder fractures illustrate the methods which may be used to encourage the patient to use the extremity in a normal manner.

While emphasis has been laid on the basic forms of physical therapy, heat, massage, and muscle stimulation, it should be stated that there are varieties of these basic forms which may be used with satisfactory effect. Contrast hot and cold baths, the whirlpool bath and the hot paraffin bath may be mentioned as examples. The use of balanced weights on pulleys and various devices which encourage the patient to use joints with a restricted

range of movements are most helpful. Also many types of apparatus have been devised which are helpful and enable treatment to be given efficiently and comfortably. Too often such apparatus is expensive and complicated and its use is but vaguely understood, so that it is employed according to directions given in a printed pamphlet which accompanies it from the manufacturer, who rarely underestimates what it will do or the number of conditions it will benefit. By all means let us be ready to take advantage of any advances and improvements which science offers, but let us demand that the criterion of the therapeutic effect expected from any piece of apparatus be a scientific and medically correct one and not an empiric one determined by its maker. Helpful as apparatus may be, it does not eliminate the element of judgment in how and when it should be used, nor can we blindly accept the statement of the maker as to its therapeutic effect. The accepted list of the Council on Physical Therapy of the American Medical Association is a reliable guide to apparatus which performs as claimed.

OCCUPATIONAL THERAPY

Any discussion of physical therapy in the treatment of fractures would be incomplete without mention of occupational therapy. Occupational therapy is a method of rehabilitation which is most useful in the treatment of fracture patients.

Occupational therapy is chiefly valuable because it supplies a real incentive for the patient to use the impaired part. A definite task is given him to perform and in spite of himself he becomes interested in completing it, with the result that he is inspired to renewed effort and unconsciously develops the attitude of mind which is necessary for recovery. Unfortunately, this form of physical therapy requires trained attendants and some apparatus so that its use is largely restricted to centers where these requisites are available; ingenuity, however, may work out simple tasks which may replace apparatus for rehabilitation training. Light carpentry, which requires the use of hammer, plane, saw and sandpaper, is available everywhere and is a useful type of occupational therapy for restoring function in the upper extremity. Gardening, painting and a variety of other simple occupational pathways may be utilized to improve joint motion, increase muscle strength and control, and above all build up the patient's morale and help him progress from the passive role of a recipient of physical therapy to an active role of one who is giving himself physical therapy. Occupational therapy is a very useful way of overcoming the subconscious resistance of the patient to normal use of an injured part for fear he will suffer a relapse. It is often a useful bridge over the hiatus between return of use and return to normal life and activity.

AMOUNT TO BE USED

Finally, some mention should be made of the amount of physical therapy which may be used. There is but one reliable guide as to whether physical therapy is being given properly and that is the reaction of the patient. Physical measures may be used up to the point of pain tolerance provided the painful reaction subsides within an hour or two. Physical therapy which produces painful reaction and muscle spasm that persists until the next treatment indicate too forceful or too prolonged treatment and both amount and duration must be reduced; persistence can lead only to resistance on the part of the patient, slowing up of recovery, and a disappointing result.

CONCLUSION

In the treatment of fractures physical therapy has a most important role. Used intelligently in the postreduction period it will reduce scar tissue, infiltration of muscles, tendons and joints, maintain a satisfactory state of the circulatory apparatus and greatly reduce the period of after-treatment. Properly employed in the after-treatment it will help the patient to do his part, which is building up that voluntary active use of the impaired extremity which alone can restore function, hasten his recovery and complete the cure.

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The
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One often hears the statement that the future of an organization depends upon its younger members. True it is, but on the other hand the young can gain much from association with the more experienced, Each needs the other if the organization is to maintain a balanced growth.

The sudden impetus given physical therapy in the last few years has brought many new workers into the field. Technicians who felt the necessity of professional contacts and stimulation in order to develop their professional growth have turned to the American Physiotherapy Association for leadership and inspiration. These new members, however, in many instances, instead of joining a chapter of the Association prefer to remain members-at-large, thereby missing many of the opportunities they hoped to gain through membership. Occasionally it is impossible or impractical for a member to join a chapter but more often it does not seem worthwhile, for the chapter confines its activities to the larger centers of population without consideration of the down-state or up-state member. This is an oversight that is to be regretted and one that every effort should be made to remedy. Chapters organized on a state-wide basis, presenting programs and meetings in various districts will do much to bring these isolated members into the fold and make the American Physiotherapy Association a live and active force in the professional life of its members as well as bring recognition and provide opportunity for co-operation among other professional groups.

It is to be hoped that in the coming year those chapters that have been limited in their appeal will broaden their base of operation in an effort to include in their activities all members within the state.

THE EXECUTIVE COMMITTEE.

Examinations for Irregular Applicants

At the Annual Convention in Boston, June 29, 1938, a resolution was introduced and passed that after June 1st, 1939, applications for membership by examination in the American Physiotherapy Association will not be accepted.

The Editorial Board is pleased to announce that the REVIEW has been moved to new and larger quarters at 737 North Michigan Avenue, Room 423. The services of the office are available to you and we hope that anyone coming to or through Chicago will feel free to accept our hospitality.

Miss H. Edna Diggdon, business secretary of the American Physiotherapy Association, was married on October 29 to Mr. Donald A. Cleaveland, son of Mr. and Mrs. Walter Cleaveland of Cleveland, Ohio. Mrs. Walter Cleaveland is one of the Vice-Presidents of our Association.

Mrs. Corabelle Brown of Minneapolis, Minnesota, has just returned from London, England, where she attended the convention of the Chartered Society of Massage and Medical Gymnastics.

The Curative Workshop of Minneapolis is now housed in a new building which is very attractive and is furnished with new and modern equipment.

Films on Physical Therapy

The Council on Physical Therapy is utilizing motion pictures as an educational medium to stress the importance of physical therapy as an adjunct to the practice of medicine and surgery. Films which have been prepared and are now available for loan to those wishing them for educational purposes include:

Aids in Muscle Training
Occupational Therapy
Underwater Exercises
Massage
Contraction of Arteries and Arteriovenous Anastomoses
Effect of Heat and Cold on Circulation of Blood
Effect of Massage on Circulation of the Blood
Therapeutic Exercises for the Shoulder Joint Following Dislocation
Treatment of Compression Fracture of the First Lumbar Vertebra.

These films may be procured by writing to the Director of Exhibits of the American Medical Association. An advance request will insure the film being reserved for the desired date.

Department of Physical Therapy

The value of physical therapy in an increasing number of diseases is being recognized more generally by hospitals and the services in this direction have been gradually extended. Hospitals seeking guidance in the organization and management of a modern physical therapy service find it advantageous to observe the requirements which have been laid down by the American College of Surgeons in the Minimum Standard for Physical Therapy Departments in Hospitals as explained in detail in the *Manual of Hospital Standardization.*

If the department is to achieve the desired results it is imperative that it be under competent medical supervision. This is best accomplished when the director is a medical graduate specially trained in physical therapy. Without a medical education and special training in this branch of work, he is not capable of judging the type of treatment best suited to the patient's condition. Physical therapy is of value only when properly administered but may be harmful when practiced by a person not having adequate knowledge of anatomy and physiology.

It is important that well trained technicians be available to assist the director in the treatment of these cases. The status of the physical therapy technician is being improved through registration with the American Registry of Physical Therapy Technicians as sponsored by the American Congress of Physical Therapy. The educational standards for technicians or aids have been well established by the American Physiotherapy Association.

Hospitals are advised to give serious attention to this form of treatment for its value in hastening convalescence and in stabilizing end-results. The limited number of recognized physical therapists makes it necessary that several hospitals must often share the time of one specialist in this field. However, every hospital has its own individual problem to consider in this respect and with the assistance rendered through the College can work it out to the best advantage.—*From the "Twenty-First Annual Hospital Standardization Report," Bulletin of the American College of Surgeons, October* 1938.

The Fourth World Conference of Workers for Cripples is to be held in London, England, at Bedford College, from July 15 to 22, 1939, under the auspices of the Central Council for the Care of Cripples. Three subjects have been selected for discussion: (1) preventive orthopedics in childhood; (2) the education, vocational training, and subsequent employment of the crippled child; and (3) the industrial cripple.

Registration

The American Physiotherapy Association wishes to call the attention of its members to the fact that the final date for courtesy registration of its members as of August 29, 1936, with the American Registry of Physical Therapy Technicians, is January 1, 1939. Registration after January 1, 1939, may be obtained only by examination following graduation from an approved school. Application for registration should be made to Miss Marion G. Smith, Registrar, 30 North Michigan Avenue, Chicago, Illinois.

ABSTRACTS

John S. Coulter, M. D.

Essentials of Spastic Paralysis

P. M. Girard, M. D., Dallas, Texas. Tri-State Med. J., 10:9:2038, June 1938.

Treatment

The primary objectives in the treatment of spastic paralysis are the prevention or correction of deformities and the teaching of relaxation and coordination. These objectives are obtained through physical therapy, occupational therapy, proper selection of toys and surgery.

In all cases there will be periods when no appreciable progress will be noted, but neglect of treatment at this time may permit the development or recurrence of deformities. The progress, at best, will be extremely slow, but with patience and perseverance over a period of years, it is surprising, even in severe cases, how much improvement may be obtained. The training possibilities of the spastic child have no limits. The parent or instructor should never impress upon the child the feeling that his progress has been discouraging or disappointing; always avoid any sense of complete failure. This feeling certainly would not be conducive to putting forth one's best efforts.

Frequently it will be found that a spastic child may relax better upon a hard bed rather than on a table. Also, children frequently will cooperate better if the exercises are given with their clothes on instead of undressed.

If a child tires of taking the exercises, he should not be forced to continue but should be given a short vacation or rest from the treatments,—from one to two weeks.

Exercises in a warm swimming pool are good for certain cases, but in general pool work is too exciting and frequently causes increased rigidity of the muscles. If this type exercise is used, the water should be warm and the child treated during a period when no other children are in the pool, and then only under the direction of a trained person. Under these conditions pool work is excellent. This form of treatment is practical and very useful in adequately equipped institutions.

The treatments range from the simpler to the more complicated. A certain child need not necessarily begin at the beginning but should start on that exercise which he is able to do easily and then work on through the more complicated ones. The arrangement of exercises should not be according to certain parts of the child's body but according to their simplicity and should be listed in the normal order in which they should be given. If only one part of the child's body is involved, only those exercises pertaining to that part should be given.

Outline of Treatment

1. Physical Therapy: morning period 45 minutes.
2. Rest hour: 12:30 to 2:30 p. m.
3. Speech training: 2:30 to 2:45 p. m.
4. Rest period: 2:45 to 3:15 p. m.
5. Occupational therapy: 3:15 to 4:00 p. m.

Teaching Relaxation and Coordination by Physical Therapy

Physical therapy deals with exercises designed to teach the child voluntary relaxation and coordination. By this is meant teaching a child having a spastic or tight muscle group to relax that group voluntarily and then to contract the opposite group, not with all the power he possesses but just enough to accomplish the desired motion in an easy graceful way. This is not an easy task and requires endless endeavor on the part of both child and instructor. Grasping a spastic muscle gently, stroking or tapping frequently causes noticeable relaxation. This, then, becomes the simplest form of physical therapy.

The instructor or mother should not be in a hurry, under tension, or bothered with household duties when giving instruction. The same hour each day should be set aside for the treatment. The room must be quiet, warm and free from outside influences, such as other children and objects which distract the child's attention.

The Place of Ultraviolet Radiation in Pediatrics

Frank Van Der Bogert, M. D. In Archives of Pediatrics, LV:6:340, June 1938.

Of the local skin lesions, erysipelas appears to give the most startling results. Although because of insufficient penetration of the shorter wave length, bactericidal though they are, the effect upon the organisms is probably negligible, spectacular results in erysipelas have been obtained due perhaps as suggested to Cleveland to an increase of leukocytes in the skin and a resulting increase in activity and efficiency of local defensive mechanisms.

I am told that at the New York Baby's Hospital they have found no better treatment than the light.

Stubborn cases of ecthyma, which is thought to be an ulcerative variety of impetigo contagiosa, may be definitely benefited; I have known this to occur.

My conclusions would be that there is a not inconsiderable group of conditions in infancy and childhood which can be definitely benefited by ultraviolet therapy; that, with the exception of some superficial skin lesions, the effect is a general one associated with calcium metabolism or mobilization and that the sufficiency in vitamin D, apparently so essential, may be supplied with more promptness and certainty through direct or indirect radiation. My own experience has led me to prefer reference to a trained physical therapeutist when one is available but I believe that the lamp has a place in the armamentarium of the practitioner who is willing to equip himself with a working knowledge of indications and dosage. However, it may be said upon unquestioned authority that its indiscriminate and unindicated use is not without danger.

Prevention of Foot Drop in Prolonged Bed Rest

David R. Lorree, M. D. Ellensburg, Washington. Northwest Medicine, 37:5:147, May 1938.

Essentially the same care for the feet of the chronic bed patient is needed as for cases of leg fractures, arthritis, diabetic arteriosclerosis and paralysis such as is encountered in poliomyelitis. This consists in maintenance of proper position, relief from the weight of bed clothing, and measures for assuring good circulation and tone. Whatever device is used should allow for free movement of the toes. A simple blanket roll inserted under the bed clothes at the foot of the bed may serve for cases where special care is deemed unnecessary.

In a majority of decubitus patients a special foot box can be provided. It is made of light wood and has sides, a back or foot, and a top, with no bottom to bruise the heels. The dimensions may vary to suit the size of feet, and also to adjust the amount of increased dead-air space that must be kept warm.

The advantages of such a box are self-evident. It allows right angle flexion of the feet with a surface to push against occasionally in maintaining muscle tone and circulation. There is a posterior window, through which the toes may protrude in occasional grasping and flexion exercises for these members. The top and sides relieve the weight of bed clothing and prevent lateral rotation. The feet can easily be withdrawn from the box, when it is desired to flex the knees or to lie on the side. The box is primarily for daytime use if the patient is accustomed to lying on his side at night and does lie in decubitus during the day. The design secures a minimum of air space around the feet. Hot water bottles, electric pads or light bulbs may be used if heat is advisable.

Injuries in the Region of the Shoulder-Joint

Capsule and Tendon Injuries

R. Watson-Jones, M. Ch. Orth., F. R. C. S., in Brit. Med. J., page 29, July 2, 1938.

The adhesions may follow periarthritis or a simple strain or contusion of the shoulder, or they may arise insidiously when a fracture of the elbow, forearm, or wrist is treated with the whole limb in a sling. Abduction and external rotation movements are limited. It is the limitation of external rotation which is of significance. The normal shoulder cannot be abducted beyond the right angle if the humerus is held internally rotated, and until external rotation movement is regained abduction cannot be regained. The range of rotation is tested with the elbow to the side and the forearm and hand pointing forwards. Normally it is possible to rotate the limb out through almost 90 degrees, so that the forearm and hand now point sideways. If this is completely limited it is a waste of time to practice abduction exercises. The patient should stand with his back to the wall, with his elbows touching it, and turn the forearms further and further out until the hands reach the wall. He must try to reach the back of his neck, and, with the fingers clasped, move the elbows back into the position of true ab-

duction. As external rotation improves, he reaches over the top of his head to the opposite ear. He may then practice crawling up a wall with his finger-tips, marking the level reached and trying to attain a higher level every day.

Many shoulders, temporarily stiff after dislocations and minor injuries, have been made permanently stiff by injudicious manipulations, performed too early, repeated too often, followed by passive and forcible stretching.

Treatment of Tuberculosis of the Trachea and Bronchi

John Devereus Kernan, M. D., New York. Annals of Otology, Rhinology and Laryngology, 47:2:306, June 1938.

One method of treatment is the application of various chemicals. Several strengths of silver nitrate have been used up to 30 per cent. These seem to act very favorably on the ulcerations, bringing about a healing and reducing the swelling in the bronchus quite rapidly. Part of these effects probably are due to the fact that a good deal of secondary inflammation is present around the tuberculous ulceration and silver nitrate acts favorably on that. Silver nitrate seems perfectly safe and has been used a great deal. The objection to silver nitrate is that it appears to produce an excessive amount of scar tissue which results in the closure of the affected bronchus. This may be a real disaster if the lung beyond the stricture is infected. Less irritating substances, such as chaulmoogra oil, have been suggested. Some authors have reported very favorable results from the preparation in tuberculosis of the larynx. This would appear to be worth while trying, although Schugt, who had very extensive experience at the Sea View Hospital, Coney Island, N. Y., found it to have little effect.

The treatment which has appeared to this author to heal ulceration most with the formation of less scar tissue has been that with the mercury vapor lamp. Applications are made through the bronchoscope for two or three minutes every two weeks. Observation after a treatment shows a white fibrous film present over the lesion. Healing appears to take place quite rapidly. Treatment with this light is that most favored at the present time as it is safe and appears to heal the lesions with little scar formation.

To sum up, I have proposed in the first place, pneumothorax with immobolization of the lung when there is tuberculous ulceration of the bronchus. The ulceration is then treated, preferably by the application of the mercury vapor lamp. The chief sequela of the ulceration, provided it is successfully healed, will be contraction of the bronchus by scar tissue. Two methods of treatment are proposed in these cases in which the lung is successfully dried up. First, it is suggested that the bronchus be closed by coagulating its wall with the purpose of relieving any wheeze due to entrance and exit of air and to protect the lung from secondary infection. Secondly, these cases may be let alone. If it is necessary to maintain an open lumen during the course of aspiration, it is proposed to dilate the strictured bronchus by the application of a negative galvanic current, using the copper electrode. If it is found impossible to clear the lung of infection by repeated bronchoscopies, the suggestion is made that such a lung might possibly be removed by pneumonectomy.

Emotional Factors in the Rehabilitation of the Physically Disabled

Leon Rexnikoff, M.D., Clinical Director, Hudson County Hospital for Mental Diseases, Secaucus, N. J. In the American Journal of Psychiatry, 94:4:819, January 1938.

For many years the problem of rehabilitating the physically disabled has been handled almost entirely from the physical point of view.

When, as a result of an accidental injury or disease, a man lost a leg or an arm, he was treated at a hospital and later supplied with a more or less workable artificial limb. If he had a few weeks or months in the hospital, the chief concern of the physicians was to do the best they could surgically to correct his deformity. If the patient was indigent and there was a social agency cooperating with the hospital, their only concern was to purchase a serviceable artificial leg or arm for the patient. Little attention was paid to his occupation prior to the injury, whether or not the artificial limb would enable him to continue with his previous work, or whether the industry in which he had been employed would give him the same position that he had had before the injury occurred.

Still less consideration was given to the question how the disabled man would react to his new situation, and certainly no thought was given, at least from a practical point of view, to what the individual's emotional reaction would be toward his body.

Gradually it has been realized that correction of orthopedic deformity alone is not sufficient to return the injured individual to the community as a self-supporting person. In recent years vocational examiners and social workers have entered the field of rehabilitation of the physically disabled, and it is only a few years since psychiatrists and psychologists have begun to occupy themselves with problems of this sort.

Summary and Conclusions

1. The function of the New Jersey Rehabilitation clinic is described.
2. Advantages of application of psychiatric principles to the work with physically disabled are pointed out.
3. The New Jersey Rehabilitation Clinic is the first of its kind to make a complete psychologic and psychiatric study of clients applying for rehabilitation, in addition to social and vocational investigation.
4. Psychiatric study at this clinic has contributed greatly towards the efficiency of the work in rehabilitating the crippled and disabled and has proven to be of educational value to the vocational examiners and other personnel.
5. Because of early elimination of cases not adapted for ordinary rehabilitation, the new approach of the clinic has helped to save considerable money for the state, which by far exceeds the small expense required for the services of the additional personnel.

Thermal Effects of Short Wave Diathermy on Bone and Muscle

Stafford L. Osborne, B. P. E., and John S. Coulter, M. D., Chicago. Archives of Physical Therapy, XIX:5:281, May 1938.

When a limb is exposed to short wave diathermy the results indicate that the temperature of its tissues decreases from the skin, which is nearest the source of energy, toward the marrow of the bone. This thermal gradient from the surface to the interior of the limb is convincingly demonstrated by the fact that when the dosage was excessive, the histologic damage of the tissues manifested a similar gradient of injury from the skin to the bone. This confirms our previous observations on human subjects, in which the temperature at different depths in the tissues from the skin to the periosteum was determined after exposures of the thigh to short wave diathermy. That the bone does not heat more than the surrounding muscle is fortunate, for otherwise short wave diathermy would be dangerous and, in view of its rather extensive use, would have produced necrosis of the bone in a large number of patients. As it is, the rich supply of sensory nerves to the superficial tissues serves to protect underlying tissues from injury. The difference between the degree of heating of dead and living tissues, which according to our results obviously exists, must be due to the fact that the circulating blood dissipates heat and plays a very significant role in the regulation of the temperature of the tissues. The importance of the circulation in this regard has been definitely proved particularly by the experiments of Mortimer and the observations of Binger and Christie. Mortimer determined the temperature of the same organs of animals on exposure of the trunk to short wave diathermy before and after death. He found that the temperature of the various organs varied little in the living but pronouncedly in the dead animal.

Claims that the wavelength specifically determines the depth and degree of heating and that wavelengths of approximately six meters heat bone or other deep tissues with less production of surface heat than do longer waves are not substantiated by our results. It should be recalled that such claims are not based on actual measurements of the temperature of living tissues. Our results on living tissues suggest the reverse of these claims; that is, they indicate that a wavelength of twenty-four meters is preferable to one of six meters for local deep heating. Such a conclusion is not warranted, however, because other factors than wavelength must be considered. Indeed, there is no way of determining quantitatively the output of energy delivered to the tissues by a shortwave generator. For example, one generator is built to deliver undamped waves of 12 meters and another 24 meters. How much energy the two generators are actually delivering to the exposed limb at present cannot be determined. In view of our ignorance, it is more rational to postulate that when the twenty-four meter wavelength generator is used, more energy is delivered to the limb than when the other generator is used. Certainly it is erroneous that the observed difference in heating is related solely to wavelength. Hence, we believe that all claims regarding specificity of wavelength action are at present entirely hypothetical.

Conclusions

1. The local application of short wave diathermy to the thigh increases the temperature of the bone marrow, and, of course, the temperature of the bone marrow is increased more than that of the rectum or general body.

2. During the application of short wave diathermy to the limb of a living animal, the thermal gradient is from the periphery to the interior. The temperature of the muscle is higher than that of the bone marrow. Similarly, if injury accidently occurs, the degree of injury decreases from the periphery to the interior.

3. We could obtain no true evidence indicating that living tissues manifest a specific thermal response to short waves of different lengths.

Occupational Therapy for Psychotic Patients in Midlife

Frank E. Leslie, M. D., Manager, Veterans' Administration Facility, Northampton, Mass. 15:1:60, July 1938.

The man of 40 and older is no longer keenly interested in athletics. A few innings of baseball, and he tires. Tennis is too lively, and strenuous games have largely been replaced by pool, indoor tennis, quoits, and croquet.

We maintain a list of occupations of the men prior to hospitalization. The 650 patients represent 93 different fields of occupation. There are 2 actors, 7 bookkeepers, 5 stenographers, 15 carpenters, 3 jewelers, 5 musicians, 13 painters, etc., but when we seek workers along these lines, we find them indifferent or too ill.

This affects utility projects to a marked degree. It is now difficult to find men capable for work in the laundry, or paint details, in the utility shops, and even on the farm. Those who do work at these details require more supervision, their work is of poor quality, and they no longer are able to show sustained effort. This means that in the future all branches of our service must put less dependence on the amount and value of utility output from patients, and eventually must maintain upkeep activities with more utility personnel.

Summary

The problem of convalescent therapy for male, mental patients over 40 years of age is discussed.

The Veterans' Administration has a unique medical problem in a sharply different group of invalids.

Methods of treatment must, of necessity, be changed from those used when disabled veterans were twenty years younger.

Men in midlife give more thought to life's higher values. Nature study, birds, flowers, and music have a broader meaning. The welfare of others is more manifest than when they marched away, carefree, to war.

A workable plan is suggested by which occupational therapy, somewhat modified, is shown to be a useful and necessary method of treating men in midlife.

Surgical Procedures in General Practice

S. L. Higgs, F. R. C. S. (Much has been written but little is known with certainty about this common minor ailment. It is an annoying condition, not only to the patient, but also to the doctor, as treatment so often fails to effect a cure, with consequent dissatisfaction to all concerned.) ; in Brit. Med. J., July 23, 1938, page 190.

In the late stage, where adhesions have formed, a tennis elbow usually can be cured in a dramatic manner by a single manipulation. The suitable case can be detected in the following way. The fingers and wrist are flexed and the forearm pronated. The elbow is then extended. By these means the affected muscle group is put on the stretch. If the range of extension is limited and causes pain at the elbow, we may assume that contractures have formed and that the case will respond to forcible stretching. The manipulation (Mill's method) can be done without an anesthetic, less painfully after an injection of 2 cubic centimeters of 2 per cent novocain into the area of maximum tenderness, but best of all under anesthesia from gas or from an evipan injection. Only a moment's relaxation is required. The muscles are put on the stretch in the manner described. With one hand the operator grasps the flexed fingers and wrist, and with the other the elbow, placing his thumb behind the radiohumeral joint. The elbow is then forcibly extended, and simultaneously the flexion of the hand and pronation of the forearm are increased to the full extent. A "crack" is usually heard and felt in the region of the muscle origin at the elbow. No after-care is necessary, and the patient should be encouraged to resume active use of the arm.

Effects of Heat, Cold, and Other Stimuli Upon Human Circulation

Clarence W. Dail, M. D. and Fred B. Moor, M. D., (Loma Linda, California). Archives of Physical Therapy, XIX:3:141. March 1938.

Summary

1. Applications of heat in the form of radiant heat, fomentations, diathermy, or steam baths give rise to peripheral vascular dilatation as shown by the plethysmogram of the arm.

2. Applications of cold water or ice to any part of the body cause peripheral constriction as shown by a decrease in arm volume.

3. Psychic stimuli, such as the anticipation of the application of ice or the prick of a pin, are potent means of producing peripheral constriction.

4. The drinking of hot or cold water, and in some subjects, even neutral water, causes peripheral constriction. If hot or cold water is introduced into the stomach through an insulated tube, a reduction in arm volume results, but neutral water given in this way does not have this effect.

5. It is indicated but not absolutely proved that heat to the body surface causes a decrease in the size of the heart and the density of the lung fields. Cold stimuli to the body surface on the other hand cause the opposite effects.

Modern Concepts of Laryngeal Tuberculosis

Julius P. Dworetsky, M. D., Liberty, N. Y. Annals of Otology, Rhinology and Laryngology, 47:2:481, June 1938.

Since tuberculosis of the larynx is nearly always secondary to pulmonary tuberculosis, all our efforts should be directed towards the treatment of the pulmonary lesion. As stated previously, the healing of the laryngeal lesion invariably depends on the healing of the pulmonary lesion. It is of paramount importance to do everything possible for the control and cure of the pulmonary lesion. However, it is not within the scope of this paper to discuss the treatment of pulmonary tuberculosis, but since laryngeal tuberculosis is so intimately associated with pulmonary tuberculosis it is not possible to speak of one without discussing the other, and I will therefore mention in passing the cardinal methods universally accepted in the management of pulmonary tuberculosis.

Rest is the chief underlying principle in physical therapy and should be employed in all forms of tuberculosis which show any evidence of clinical or even pathological activity. The kind and the amount of rest will depend mainly on the degree of activity of the lesion. From the principle of rest, collapse therapy was really derived since it is a mechanical way of supplying local rest to the affected lung. Of all the remedial agencies applied in pulmonary tuberculosis, I believe that collapse therapy has done more for the prevention and cure of laryngeal tuberculosis than all the other measures combined. Of the principal forms of collapse therapy we have:

1. Artificial pneumothorax—the most common and most efficient of all.

2. Oleothorax—a method still used very sparingly in the U. S.

3. Operations on the phrenic nerve—either as an independent measure or else in combination with other surgical measures.

4. Pneumonolysis—Always after a pneumothorax has failed to close a cavity.

5. Thoracoplasty, partial or complete—usually when the above surgical measures have failed or else could not be applied.

As to local treatment of laryngeal tuberculosis I find that the more intensely we apply treatment to the pulmonary lesion the less need is there for local therapy. In cases where collapse therapy is successful I practically never find it necessary to apply local treatment. When the cavities close and the sputum becomes negative, the laryngeal lesion invariably clears.

In cases where collapse therapy cannot be applied and where the lesion in the larynx remains localized and interferes with the functional activity of the larynx, cauterization often is of great aid. Chaulmoorgra oil applied locally or in a form of a spray often brings comfort to these patients. Quartz light therapy is now being employed but in my limited experience with this agency it is still of dubious value.

Treatment of Acute Poliomyelitis

Abstract. In Jour. A. M. A., 110:15:1234, April 9, 1938.

The new system of treatment in acute poliomyelitis that Mills describes has produced results over a period of twenty years so promising that it appears that one's views as to the degree of recovery possibly will have to change. In opposition to the accepted theory

the view is taken that the pain in the extremities is almost completely vascular in origin. The muscular pain results from venous engorgement and consequent anoxia of the paralyzed muscles. The venous return from the extremities is influenced mainly by tone and activity of the muscles. In poliomyelitis the interference with this venous return is often of extreme degree. At first there is venous stasis, and later on capillary stasis and capillary paralysis. As a result mild trophic changes develop in the skin, bones, joints, fasciae and especially the muscles. Immobilization of paralyzed limbs, with consequent vascular catastrophe, leads to contraction of the muscle sheath and anemia of muscle fibers, with subsequent mild fibrosis. The ischemic pseudoparalysis is accentuated by stretching and relaxation of muscles, tending to cause a permanent shortening of the length of the fibers and often resulting in slight deformities. The irritation stage is an artificial stage, which may invariably be overcome in two or three days by a well regulated system of frequent passive movement, fomentation and hydrotherapy. In no case does pain persist more than three days, although it will usually recur in the early mornings after the limb has been rested during the night. Cutaneous hyperesthesia also disappears under the treatment. As soon as the temperature drops, the active phase of reeducation is started; that is, reeducation is begun within one week of the onset of paralysis. The restoration of circulation is accomplished by hydrotherapy which makes use of the rapid alternation of hot and cold sprays in the bath. The limbs become suffused with pink within ten minutes, the areas last to lose their cyanotic appearance being those which overlie the paralyzed muscle groups. By this simple measure applied daily trophic changes are avoided and the later application of such operative procedures as sympathetic ramisection are rendered unnecessary. Briefly, instead of being dealt with by rest and immobilization in the acute stage, the affected limbs must be treated energetically, by foments, by hydrotherapy and by movement through every range of each joint every two hours, and a finely graded system of reeducation must be started as soon as possible, usually within the first week of paralytic manifestations. Under such a regimen wasting of paralyzed muscles occurs only to a small degree. It is not claimed that this treatment will cure all cases at all stages of the diseases. So far only thirty-five cases have been treated in the early stages, but in view of the degree of improvement in these and in 1,400 chronic cases, it is claimed that Sister Kenny's methods will give the maximal recovery possible in every case treated within the first two months of the disease.

Progress in Otolaryngology

Summaries in the Bibliographic Material available in the field of Otolaryngology. The Paranasal Sinuses, Samuel Salinger, M.D., in Archives of Otolaryngology, 28:3:418, September 1938.

Physical Agents—Tebbutt conducted a series of experiments to determine the effect of local heat and cold on the temperature within the maxillary sinus. This was registered by means of a delicate thermopile connected with a registering galvanometer the readings of which had previously been determined experimentally. It was found that cold compresses, an ice bag, hot compresses, a hot water bottle or an electric heating pad caused no change of temperature within the antrum or the sphenoid sinus. A drop of 1 to 2 F. in the temperature of these sinuses was noted after the use of the infrared lamp and the high frequency oscillating current. This is attributed to evaporation of increased nasal secretions which follow the use of these agents. The value of the treatment is attributed to the increased secretion with improved drainage.

For the relief of tension Snow advises radiant heat (50 candle power lamp, carbon filament) usually at 3 feet (0.9 meter) for twenty to thirty minutes. It causes relaxation of surface tissues and increases phagocytosis. This is followed by diathermic treatment through electrodes of 22 gage composition metal. The exact details of the size and application of the electrodes are given in the article. The author seems to attach considerable importance to these details for the accurate application of the current to the various sinuses. Pledgets of cotton soaked in a solution of metaphen and ephedrine diluted with warm water are placed in the nose, and a current of 200 milliamperes (d'Arsonval) is passed between the electrodes for about thirty minutes. This is followed by an intranasal application of ultraviolet rays from a water-cooled quartz mercury vapor arc lamp for ten seconds. In some cases the patient receives also a treatment to the body with both the carbon filament or the carbon

arc lamp and an exposure to the ultraviolet lamp.

Troup claims the type of condition most amenable to physical therapy is that in which there is no gross nasal obstruction, polyps or diseased tonsils. He finds also that infections with Streptococcus hemolyticus are less favorable than those due to other organisms. The aims of physical therapy are (1) to relieve congestion, especially about the natural ostiums, (2) to improve circulation, thus purifying the blood supply to the mucous membranes of the sinuses, (3) to drain the infected secretions, and (4) to restore the function of the ciliated mucous membrane. The author uses general ultraviolet irradiation, local applications of rays from the quartz lamp, local exposure to infrared rays and short wave diathermy. (It is difficult to appraise this treatment accurately, as the author states that he uses adjuvants in the form of autogenous vaccines, colloidal manganese, intestinal lavage, corrected diets and vitamin B.)

Diathermy—Short wave diathermy seems to be finding favor in the treatment of sinusitis whether acute or chronic. Talia reports a number of successful results and shows roentgenograms taken before and after treatment. It is particularly effective in cases of maxillary sinusitis. One electrode is placed over the cheek and the other behind the occiput. For chronic conditions up to thirty treatments are given, the length of each treatment beginning with 15 minutes and increasing up to 30 minutes. A wavelength of 7 to 8 meters is used. The author alleges also that much relief from pain results when the treatment is applied for frontal sinusitis.

Guarini quotes the literature freely on the beneficial effects of short wave therapy, which he corroborates from his own experience. He mentions differences in opinion as to the size of the electrodes to be used. Also he calls attention to possible danger to the orbit and advises keeping the current away from it even though the treatment is at the same time recommended for ethmoid and sphenoid diseases. For acute conditions he has found five to six treatments sufficient; for chronic conditions as many as thirty treatments may be given.

Leichner and Schmidt report good results with this form of therapy in 50 cases of chronic disease, in 34 of which the diagnosis was confirmed roentgenographically. Twelve of the patients had been subjected to radical surgical procedures without relief, and the rest had been under more or less prolonged treatment with other measures. They used a 6 meter wavelength at 300 watts and administered fifteen minute treatments three times weekly. Acute conditions were treated daily. At the Jefferson Hospital these treatments were preceded by lavage with physiologic solution of sodium chloride. In some cases combined lavage and suction were used and in others the Proetz displacement method. They found a temporary increase in discharge at the onset with rapid subsidence as the treatments were carried on. Disappearance of pain was a characteristic result, observed in all cases; 39 of the patients were much improved, 11 moderately improved, 2 slightly improved and 3 not affected.

Fischel uses substantially the same technic as described and mentions the appearance of a marked nystagmus in one case, which promptly subsided.

Rosenwasser and Bierman recorded the intranasal temperatures after the use of short wave therapy produced by machines of 50,000,000, 20,000,000 and 18,750,000 oscillations at wavelengths of 6, 15 and 16 meters. The average increase in temperature was 1.31 F. The authors found, however, that the preliminary use of cocaine and epinephrine prevented the rise in temperature, which proves that the beneficial effects of short wave therapy are due to vasodilation.

Peters technic in treating hyperplastic or chronic catarrhal ethmoiditis is to apply a 10 per cent mild protein silver tampon high in the middle turbinal area and pass the diathermy current (250 milliamperes) through for twelve to fifteen minutes twice weekly. He states that the closed hyperplastic type with polypoid degeneration is not amenable to this therapy and requires surgical treatment.

Massage in General Practice

E. B. Clayton, M.B., B.Chir. In the Practitioner, CXLI:2:169, August 1938.

For relaxation—There are many methods of teaching general relaxation. Everyone should learn to relax in his youth so that when he needs to relax in later life it will not be impossible. Massage is used to relax those who cannot relax themselves. Soothing rhythmical general massage is employed consisting of gentle kneading and stroking to the limbs, back and sometimes abdomen, finishing with the head, forehead, and around the eyes. The patient should recline in a comfortable position being well supported with pillows. This type of

massage is used for neurasthenia, sleeplessness due to worry, and mild spastic paralysis. Severe spastic paralysis makes massage impossible since the least touch induces violent spasm. A single limb may be relaxed in a similar way. The limb is well supported on pillows, then soothing stroking is applied slowly and rhythmically to the whole limb. When the limb is relaxed a gentle passive movement can be given. This is often used for arthritis, spastic paralysis of one limb, or joint injuries when muscle spasm prevents movement. The essential points about massage for relaxation are that the movements must be soothing, rhythmical, and slow. The massage to the forehead and around the eyes is usually considered to be the most soothing form of all.

For exhaustion—Suitable patients are those exhausted after severe illnesses. The treatment should be progressive. It begins with effleurage and kneading to the limbs and a little deep breathing follows, then back and abdominal massage. The patient is now receiving general massage. Active movements for the proximal joints of the limbs and for the trunk come next; massage is gradually replaced by movements and the course of treatment ends with a scheme of general exercises. Sometimes at the stage when general massage is used, the massage is made more stimulating by adding hacking and clapping to the limbs and back. The dose of massage and movements is regulated by the patient's feeling of fatigue and the effect noted on the temperature chart. A rise in temperature, pulse, or respirations would suggest that the treatment was too vigorous. A similar progressive treatment is used for cardiac disease when compensation is being established. The exhaustion associated with marasmus in infants is benefited by general massage, applied to the limbs and back. The abdomen is usually omitted. Also included under this heading are those unfortunate persons who are trying to carry on while suffering from some chronic neurological condition which induces early fatigue. General massage besides refreshing their muscles has a good psychological effect and encourages them to continue in their effort.

The Physical Aspects of Ultraviolet Therapy

W. W. Coblentz, Ph.D., Sc.D., Washington, D. C. Jour. A.M.A., 111:5:419, July 30, 1938.

According to Morton, Heilbron and Kamm the destruction of vitamin D is the result of excessive irradiation (though not exclusively) by wavelengths shorter than about 2,700 angstroms. Reerink and Van Wijk report that irradiation of ergosterol with wavelength 2,437 angstroms gives rise to a series of reaction products that differ from that caused by irradiation with wavelengths longer than 2,750 angstroms. By excluding wavelengths shorter than 2,750 angstroms it was possible to convert 60 per cent of the ergosterol into vitamin D before the secondary reaction (destruction of vitamin D) became important. When the wavelengths 2,537 and 2,654 angstroms were included, only a much smaller amount of ergosterol could be converted into vitamin D before destructive action interfered.

Using monochromatic radiation, Marshall and Knudson reported that the highest concentration of vitamin D which could be produced by direct irradiation of ergosterol was 35 per cent. They also report that vitamin D is destroyed by radiation of the same wavelengths that produce it.

In view of the foregoing results, even though no ill effects seem to have been reported, and an excessive exposure is limited by skin tolerance as manifested by the erythemal reaction, the question arises as to the desirability of conducting ultraviolet therapy with lamps emitting an excessive amount of ultraviolet radiation of wavelengths shorter than 2,800 angstroms. For example, in the so-called cold quartz type of mercury vapor lamp, more than 95 per cent of the biologically effective radiation that is emitted is of the wavelength 2,537 angstroms. These short wavelengths have a specific germicidal action and, hence, are useful in dermatology. Nevertheless it is a question whether rays of such short wavelengths should be used in general ultraviolet therapy. In view of this uncertainty, the Council on Physical Therapy does not accept, for home use without the direction of a physician, lamps that emit an appreciable amount of ultraviolet radiation of wavelengths shorter than 2,800 angstroms.

Iontophoresis in Arthritis

Current Medical Literature, Missouri State Medical Assn. Journal, St. Louis. Abstract in Jour. A.M.A., 110:26:2181, June 25, 1938.

Bredall describes the treatment of arthritis by iontophoresis or ionization with the simple galvanic machine using acetyl-beta-methylcholine chloride. A 0.1 per cent or a 1:1,000 solution of the drug is introduced into the

affected part from the positive electrode. Absorbent paper, sheet wadding, reinforced asbestos fabric paper or cotton filled bandage is saturated with the solution and wrapped around the part to be treated. On top of this a tin lead plate or strip is wrapped around the part and connected with the positive pole of the galvanic machine. A large regular moist pad electrode is placed under the back or over the abdomen and connected with the negative pole. The current is gradually increased from 20 to 30 milliamperes and maintained for from twenty to thirty minutes. Then the current is slowly turned off, the electrodes are removed, and the parts are dried and wrapped. There may be a slight tingling sensation under the electrodes during the treatment but the strength of the current must always be within comfortable toleration of the patient. Iontophoresis is contraindicated in septic conditions and in bronchial and other types of asthma, and it must be used with caution in patients with cardiac involvement. There was definite improvement in sixteen or twenty patients. Most of these patients have previously had a long trial of treatment with conventional methods without results. Many patients showed not only definite elimination of swelling and deformity but also improvement in strength and function.

The Treatment of Rheumatoid Arthritis

Walter K. Myers, M.D., Clinical Instructor in Medicine, George Washington University School of Medicine. Med. Annals of the D. C., VII:7:220, July 1938.

Without too great detail one may mention (and not necessarily in the order of their importance): (1) Foci of infection, (2) abnormalities of colon function, (3) malnutrition, (4) anemia, (5) factors of metabolism, (6) deformities and limitation of function of the joints and periarticular structures, (7) mechanical defects in the function of joints, and (8) the mental state of the patient.

Rest is of utmost importance, probably the most important single factor in the treatment. Rest in bed, however, is not sufficient. Too often one tells the patient how many hours to spend in bed without regard to worry, anxiety, restlessness and tension. By rest is implied relaxation, repose and avoidance of fatigue.

It has been said that cooperation from practitioners of various specialties is essential for the care of the arthritic. Particularly is this true of the internist, orthopedist and physical therapist. Too often the internist and the orthopedist discount the value of the other's services. The one is inclined to apply his knowledge of the other's field. Too often the orthopedic training of the internist is rather elementary and the orthopedist's approach to the problem of internal medicine is superficial. To the internist the orthopedic problems of correction of existing deformities are difficult of solution. Even more important are the knowledge and equipment for the prevention of joint deformities; inadequate care for even a few weeks may permit the development of distressing deformities. The prescribing of physical therapeutic measures means a great deal more than sending the patient to a physical therapy technician. Detailed directions are to be given as to the measures to be employed. The patient with rheumatoid arthritis must have his directions for rest tempered with exercise. This may be general exercise, such as walking. Frequently indicated are postural exercises, muscle-setting exercises, and the retraining of groups of muscles which have become atrophied from disuse. In some instances passive exercises, such as massage and passive movements of the joints, are advisable. The various measures for increasing heat locally, such as baking, diathermy and the like, are helpful in the relief of pain and probably of the inflammatory process.

The physician who cares for the arthritic patient needs to practice a great deal of simple but sound psychotherapy.

Prevention of Colds, Influenza and Tuberculosis

Oliver T. Osborne, New Haven, Conn. In Medical Record, 148:1:13, July 6, 1938.

For individuals whose surface circulation is sluggish, there is probably no better training or calisthenics for the skin than cold sponging or showers, or even at times cold plunges, with a quick, brisk rub immediately afterward. Especially of advantage is the morning sponging of the throat and chest with cold water.

Open air exercise, whether sports or work, is always of advantage in increasing the peripheral and muscle circulation and preventing congestion of the internal organs and hence colds. However, cold morning baths and much physical exercise without proper training or proper grading of such exercise is often a disadvantage to an individual and may even predispose to colds. The condition of the child

or the adult must be considered when strenuous exercise or the more severe cold treatments are advocated. Many an adult and not a few children are predisposed to colds, and consequently other illnesses, by too strenuous bathing and too strenuous exercise. If the circulation is not good, whatever the cause, it must be improved by graded treatment, and the results should be watched; otherwise congestion of the upper air passages may predispose to the very colds that we wish to prevent.

Proper food is an important item in preventing colds. Anything that causes nervous excitation, as tea and coffee in young children, or too much meat, or a diet that allows constipation, may cause congestion of the mucous membranes and predispose to colds. In the adult, highly seasoned, rich foods, too much meat, alcohol and over-smoking, may bring about conditions of the surface circulations and mucous membranes that will predispose to colds.

It has long been recognized that constipation may produce congestion of the throat and nasal passages. Proper daily movements of the bowels will generally cause the tongue to be clean, the mouth to be properly moist, and the pharynx to have better color and less secretion of mucus. Every practitioner has seen the mucous membranes of the nose and throat improve on good catharsis and a rigid diet.

Iontophoresis and Peripheral Blood Flow

Current Medical Literature. Am. Jour. Med. Sci., Abstract in the Jour A.M.A., 111:4:-351, July 23, 1938.

Montgomery and his colleagues determined, by direct measurement, the effect of 0.2 per cent acetyl-beta-methylcholine chloride iontophoresis on blood flow in the limbs of normal persons. A few corresponding observations have also been made on patients with peripheral vascular disease. Iontophoresis through a plethysmograph invariably caused a marked increase in blood flow in the treated hand. As a rule the effect began after the current had been on for less than fifteen minutes, reached a maximum within about thirty minutes, remained at that point as long as the current continued to flow and began to decline almost as soon as the iontophoresis ceased. As a rule recovery was practically complete within an hour after the current was turned off. The patients with diseased arteries responded in the same general way, although the increase in blood flow was somewhat less marked. In the normal subjects the initial flows varied between 1 and 14 cc. and between 12 and 32 cc. at the height of the effect, and in the patients with obliterative disease the initial flows varied between 1 and 14 cc., those at the height of the drug's effect between 12 and 24 cc. No conspicuous signs of systemic effects were ever observed. The pulse rate was not significantly affected. The treated hand sometimes showed slight reddening and occasionally there was sweating of this hand for one or two hours after the treatment; but usually the prolonged exposure to the fluid in the plethysmograph produced thickening, corrugation and whitening of the skin and neither hyperemia nor sweating could be detected. There was, however, a pounding sensation in the hand at the height of the 0.2 per cent acetyl-beta-methylcholine chloride effect. This was synchronous with the pulse, and the pulsations of the fluid in the plethysmograph were visibly increased at this time. These results fully confirm the belief that iontophoresis with 0.2 per cent acetyl-beta-methylcholine chloride produces dilatation of the blood vessels in the treated part. The effect seems to be too great to be attributed to changes in the most superficial vessels alone and it is probably exerted on deeper vessels as well. If the beneficial action depends entirely on an increased blood flow, it occurs mainly in the part treated.

The Care and Treatment of Cerebral Palsies

Winthrop Morgan Phelps, M.D., Baltimore. In the Jour. A.M.A., 111:1:1, July 2, 1938.

It can be seen that the training of such children is a general problem and involves the orthopedic, psychologic, speech and educational fields. The activities must be so interrelated that the therapist in each field knows clearly what is being carried out in the other fields.

A great deal can be gained by starting treatment in these fields very early. The sooner the child is able to find out that a special regimen is necessary to make his body work for him, the less unteaching of bad habits of action will have to be utilized. During the preschool period, that is, between the ages of two and five years, the speech work should be begun. It is useless of course to attempt to teach speech to babies under one year old.

The teaching of these functions is begun at these ages because there is apparently an op-

timal age for the different activities. In other words, it has been seen that, if a child reaches the age of five or six before he is taught to speak, the attempt to teach him to speak is much more difficult than if it is started during the period when he would normally learn to speak. This is of course applied to the child in whom the lack of speech is entirely due to the handicap.

The situation with regard to walking is the same. The normal child learns to walk before the age of two. It is advisable, therefore, whenever possible to try to bring about walking during this period, as it will be much more easily accomplished. The reason for the greater difficulty in accomplishment of walking by an older child is obvious, as, when the body becomes larger and the child taller, the falls which the child takes when attempting to walk are much more painful and he is more likely to be hurt; but the optimal period is apparently also a factor in this particular activity.

The actual method of treatment, as I have said before, differs markedly for the spastic and for the athetoid child. In the case of the spastic child the fundamental principle is that the spastic muscle contracts maximally to any stimulus applied to it. The most commonly applied stimulus is the stretch reflex. This is brought about by the voluntary contraction of the antagonist of the spastic muscle. An attempt to extend the arm in the case of a spastic flexor would result in an immediate contracture of the flexor, which would block the motion.

The flaccid muscles must be treated in much the same way as the flaccid muscles of infantile paralysis are treated. That is to say, they must be protected from being overstretched and must be massaged to increase their tone. It has been found that, by forceful resisted contraction of some other muscles in the body, the flaccid muscles may frequently be brought into an involuntary, or automatic, contraction. This can be utilized as a stimulus for developing power in these muscles, and in many instances the patient can be taught to utilize this confusion to bring about a useful contraction in the apparently flaccid muscle. The normal group of muscles, of course, does not need any treatment whatever unless contracture has resulted from flaccidity of antagonists or from gravity.

The basic principle in the treatment of athetosis is relaxation. As has been said before, athetosis disappears in sleep, and the more nearly an athetosis disappears in sleep, and the more nearly an athetoid patient can be relaxed, the less will be the amplitude of swing of the involuntary contractions in the muscles. Reeducation by teaching voluntary motion from the relaxed position is then utilized, and it produces great improvement. Even in cases of moderate athetosis, gradual elimination of the athetosis has been seen to such an extent that the only remnants of it were somewhat feeble contractions in certain muscles which do not actually bring about motion in the joints. Of course the problem is much greater when the athetosis is distal than when it is proximal.

Acute Anterior Poliomyelitis

H. H. Hyland, M.D., M.R.C.P., F.R.C.P.; W. J. Gardiner, M.B., M.R.C.P.; F. C. Heal, M.D.; W. A. Oille, M.D., and O. M. Solandt, M.D., Toronto. In Canadian Med. J. 39:1:1, July 1938.

Physical Therapy

This series of cases received, in addition to rest and splinting, treatment by heat, massage, passive movements, active exercises, muscle training and galvanic stimulation. The purpose of such a program was as follows: (1) the prevention or retardation of the development of muscle atrophy; (2) the prevention of the development of contractures and deformities; (3) the reeducation of the patient in the use of muscles recovering from paralysis; and (4) in cases of muscle paralysis beyond recovery to educate the patient how to use his remaining muscles to the best possible advantage.

It is obvious that the best chance of accomplishing these objectives is by starting treatment early. Consequently, as soon as the patient's temperature was normal and the tenderness had disappeared from the affected muscles physical therapy was commenced. Early treatment consisted of the application of heat, massage and passive movements. A portable lamp producing a nonluminous type of infrared ray was the source of heat. This was used for the purpose of increasing arterial circulation and relaxing muscle spasm. In the acute stage the latter was encountered not infrequently in unparalyzed antagonistic muscles. Arm and leg baths, with the water at 95 F., were also utilized for the same purpose.

Massage, at first, consisted of movements

light in type. Effleurage, gentle kneading, and light friction were employed about the joints. The object of massage is primarily to aid the nutrition of the paralyzed muscle by increasing arterial circulation and venous and lymphatic drainage. Treatment at this stage should be brief, as overtreatment can produce paralytic dilatation of the capillaries, thus defeating the purpose of the massage. Affected extremities often can be treated while resting on splints but, if these are removed, adequate care must be taken that there is no stretching of paralyzed muscles. Although treatment is of short duration, it may be repeated two or three times during the day.

Passive or relaxed movements were used from the first. These have as their object the prevention of contractures and the preservation of mobility in the joints. Each joint was moved once daily, always exercising great care not to stretch paralyzed muscles. If two antagonistic groups of muscles were paralyzed, then passive movement was carried out only in the middle range.

Active movement is probably the most important single factor in the program of physical treatment, calling into play and exercising the entire neuromuscular unit. Muscle training was begun as soon as the slightest sign of voluntary contraction could be seen in the muscle. A definite plan was followed, commencing with gently assisted active movement, then advancing to free movement, and finally employing eccentric or concentric resisted active movement. In order to place the muscles in the best possible position for working, the sling method described by Guthrie-Smith was utilized. This consists of an overhead frame with canvas slings suspended from it. These are so arranged that an arm or a leg, or the whole body if necessary, can be suspended in slings. This method possesses the advantage of eliminating friction and greatly decreasing the effect of gravity, and any type of active movement can be carried out. It is next in value to hydrotherapy (pool or Hubbard tank) and is of greatest assistance in treatment when the latter is not available.

Respiratory or breathing exercises were also used in patients recovering from paralysis of the muscles of respiration and able to be out of the respirator for varying periods of time. These exercises are specially designed to give active exercises to all the muscles of respiration.

Galvanic stimulation possesses value as a means of producing artificial exercise of a muscle. It should be used with great care, due to the ease with which muscle fatigue can be produced. The surging galvanic current was used with discrimination in these cases, chiefly where atrophy was developing rapidly or where mild contractures were appearing.

In the treatment of paralyzed cases by means of physical therapy certain fundamental principles of muscle reeducation must be kept in mind. (1) The masseuse must make sure that the patient understands what is required in the way of active movement. It may be necessary to demonstrate this either by means of a passive movement or by movement of a sound limb. (2) Fatigue of the muscle must be avoided. This will necessitate periods of rest between exercises or alternative massage and active movements. Evidence of fatigue will be seen as loss of power and contractility. When this occurs the muscle or muscle group should be rested for a few days, then active exercise resumed in a graduated manner. Anyone who has treated a large number of cases with active movement will have made this observation; if not, then the amount of active exercise has not been carried to the desired degree which is just slightly less than the maximum. (3) A paralyzed muscle must never be stretched by the contraction of a muscle undergoing active movement. (4) One should remember not to neglect the muscles of a nonparalyzed extremity which frequently suffer from prolonged rest in bed.

Massage in Phlebitis

Current Med. Lit. Schweizerische medizinische Wochenschrift, Basel, 68:577-640, May 1938. Abstract, Jour. A.M.A., 111:2:211, July 9, 1938.

Henschen and Becker say that massage in phlebitis can mobilize a latent infection or even elicit an embolism. However, the authors recommend massage only after the phlebitis or thrombophlebitis has subsided. The signs of inflammation must have subsided. The vein in question must no longer be sensitive to pressure. In case of deeper processes on the leg, the pressure points medial to the tibia must be tested. Moreover, all the manipulations for the detection of a latent phlebitis should be used. To detect a subfascial inflammation, pronation of the foot, or adduction, hyperextension or exterior rotation in

the hip joint for the purpose of eliciting pain have been recommended. Moreover, subjective pains in the muscles and nocturnal muscular spasms must have subsided. Body temperature and pulse rate must have returned to normal. The sedimentation speed must either have become normal again or be on the decline. Moreover, the authors also used the Aldrich-MacClure test. In case of an accelerated resorption of the wheal, they regarded massage as too early. If the various tests and examinations disclose that the phlebitic process has subsided, the authors begin the massage with a mild effleurage. It serves to detect possible painfulness and changes in the pulse frequency and discloses whether real massage of the veins and the surrounding tissues can begin. In view of the purpose for which it is employed, massage consists chiefly in stroking and rubbing manipulations. The authors mention first the longitudinal massage of the saphenous veins, consisting in a loosening of the tissues surrounding the veins and in a light massage of the venous walls. Then there is the oblique massage of the branches of the veins, which influences the tissues surrounding the veins, and then the veins themselves. There is rolling massage and finally indirect elongation massage by means of alternating flexion and extension of the leg. In evaluating venous massage, the authors stress that it promotes metabolic processes of the venous wall by way of improving the circulation of the vasa vasorum, that it softens the venous wall, exerts an anti-spasmodic action, accelerates the blood stream, improves the function of the venous valves and has an indirect effect on the joints which may be involved in the phlebitic process and so on.

Investigations Into the Treatment of the Common Cold by Infrared Irradiation

J. Burrows Sherman, M.B., B.S. (Melb.). In The Brit. Jour. Phys. Med., 1:9:322, September 1938.

A short account is given of the treatment of the common cold by infrared irradiation of the accessory air sinuses. The results showed that over 50 per cent of the patients responded successfully to treatment, more especially if seen within 24 hours of the onset.

The method is easy, comfortable and inexpensive and could be very useful to large industrial concerns in reducing the havoc wrought by the common cold.

Book Reviews

FRACTURES AND DISLOCATIONS. By Philip Lewin, B.S., M.D., Associate Professor of Orthopedic Surgery, Northwestern University Medical School; Attending Orthopedic Surgeon, Cook County Hospital; Attending Orthopedic Surgeon, Michael Reese Hospital, Chicago. Volumes I and II. National Medical Monographs. Edited by Morris Fishbein, M.D. Cloth. Price, $6.00, per set. Pp. 318; 319-698, with 82 illustrations. New York: National Medical Book Co., Inc., 1937.

Fractures from accidents, especially with reference to the automobile, require that the general practitioner be able to treat fractures in an efficient manner. Due to the speed of the automobiles the injuries from accidents usually are severe. The author emphasizes the importance of cooperation between the laymen and the surgeon in the transportation of the injured person from the scene of the accident to the hospital.

The first volume discusses the general considerations of fracture treatment, the proper organization in a hospital for the treatment of fractures, and describes fractures of the vertebrae, ribs, clavicle and scapula. The second volume considers fractures of the upper and lower extremities and the dislocations. The application of physical therapy is presented. These volumes are highly recommended.

BRITISH HEALTH RESORTS, SPA, SEASIDE AND INLAND. Including those of the British Dominions and Colonies. Edited by R. Fortescue Fox, M. D., Lond., F.R.C.P., F.R. Met. S. With a forword by The Rt. Hon. Sir Kingsley Wood, Minister of Health. Cardboard. Price 2/6. Pp. 288. London: J. and A. Churchill, Ltd., 1938.

This book should be an inspiration for the publication of a like monograph on American health resorts and spas. There is a chapter on climate, health and British resorts by L. C. W. Bonacina. There are sections on the British spas, the sea coast, winter health resorts on the coast, the invalids' winter, some inland health resorts, and on spas and climatic resorts in Australia, Canada, Cyprus, New Zealand, South Africa and the British West Indies.

SPEECH TRAINING FOR CASES OF CLEFT PALATE. By M. C. Oldfield, M.Ch., F.R.C.S. Cloth. Price, 4 s. 6 d. Pp. 18, with 38 illustrations. London: H. K. Lewis & Co., Ltd., 1938.

The main disability of a child with a cleft palate is that he cannot speak so that strangers can understand. The author believes that after operation it is of the greatest importance that the patient should be trained to use the new palate correctly. In his routine, massage to the soft palate and speech training are started one month after operation. This booklet is written for the speech trainer, the more ambitious mother and the intelligent adult patient.

PROGRESSIVE RELAXATION: A PHYSIOLOGICAL AND CLINICAL INVESTIGATION OF MUSCULAR STATES AND THEIR SIGNIFICANCE IN PSYCHOLOGY AND MEDICAL PRACTICE. By Edmund Jacobson, A. M., Ph. D., M. D., Laboratory for Clinical Physiology, Chicago. Second edition. Cloth. Price, $5.00. Pp. 494, with 89 illustrations. Chicago: University of Chicago Press, 1938.

The first edition of this book appeared in 1929. In this second revised edition three new chapters concerning the electrical measurement of nervous and muscular states have been added. The volume considers the technic, the physiology and the therapeutic uses of relaxation.

It is often noted that when a person lies on a couch, as quietly as he can, external signs and tests generally reveal that the relaxation is not perfect. There remains what may be called residual tension. This residual tension appears to be a fine tonic contraction along with slight movements or reflexes. Doing away with this residual tension is the essential feature of progressive relaxation.

The author emphasizes that in the treatment of nervous states, particularly in the approach to spastic visceral conditions and to arterial hypertension, there is increasing evidence that the subsidence of symptoms becomes most marked upon the disappearance of residual tensions. Jacobson states there is no intent or purpose of offering this method of intensive rest as a panacea. He does suggest it as a treatment or as an adjunct in the treatment of acute neuromuscular hypertension (commonly called "nervousness" or "emotional disturbance"), chronic neuromuscular hypertension ("neurasthenia," "functional neuroses"), states of fatigue and exhaustion, states of debility, sundry preoperative and postoperative conditions, toxic goitre, disturbances of sleep, alimentary spasm, peptic ulcer ascribed to nervous tendencies, chronic pulmonary tuberculosis, organic and functional heart disorders, and vascular hypertension. Rest is an important physical agent, and this book is recommended to physical therapists.

A PRACTICAL GUIDE TO MASSAGE. By C. Irene Carpenter, Diplomee of the Chelsea College of Physical Education; Member of the Chartered Society of Massage and Medical Gymnastics; Member of the Almeric Paget Massage Corps, 1914-1918. *With introduction by David Katz, Ph.D., Professor of Psychology and Education at the Högskola of Stockholm. Cloth. Price, $2.00. Pp. 127. Baltimore: William Wood and Co.*, 1937.

This book deals with the fundamental principles upon which massage is based. The author emphasizes that massage must be studied in relation to other forms of treatment. No attempt has been made to describe the precise methods of application. The author states: "Whether a movement is to be given this way or that, whether iodex is to be put on or not, is immaterial; each worker must decide the details appropriate to the case for himself or herself." Therefore this book may be read with interest by the physical therapist but is not recommended as a textbook for the student.

THE 1938 YEAR BOOK OF PHYSICAL THERAPY. By Richard Kovacs, M. D., Clinical Professor and Director of Physical Therapy, New York Polyclinic Medical School and Hospital; Attending Physical Therapist, Manhattan State, Harlem Valley State and West Side Hospitals. Cloth. Price, $2.50. Pp. 468, with 131 illustrations. Chicago: The Year Book Publishers, 1938.

This small, compact, well-bound and complete volume is a new arrival in the field of physical therapy. It is one of a series of eleven volumes each of which is devoted to an exclusive field of medicine. Doctor Kovacs has performed an intricate and most difficult task in an excellent manner. Doctor Kovacs considered more than 1,000 articles in 93 scientific publications from 15 countries and from these he selected 323 of the best contributions for the year. No one interested in physical therapy can afford to overlook this valuable work and it is recommended both to physicians and technicians.

MEDICAL WRITING: THE TECHNIC AND THE ART. By Morris Fishbein, M.D., Editor, The Journal of the American Medical Association, Chicago. With the assistance of Jewel F. Whelan, Assistant to the Editor. Cloth. Price, $1.50. Pp. 212, with 34 illustrations. Chicago: American Medical Association, 1938.

This book is written with a view to assisting in the literary improvement of papers submitted for publication in medical journals. There are chapters on an acceptable paper, style, the subject and the material, construction of the manuscript, words and phrases, spelling, capitalization, abbreviations, numbers, pharmaceutic products and prescriptions, biographic material, preparation of the manuscript, illustrations, charts and tables, revision and proofreading.

THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION has adopted this book for its rules of style and the technic it follows in the correction of manuscripts. This book should be studied by everyone preparing manuscripts for publication in medical journals.

EMANOTHERAPY. By F. Howard Humphris, M.D., F.R.C.P., D.M.R.E., Honorary Consulting Radiologist to, and Member of, the Medical Advisory Board of St. John Clinic and Institute of Physical Medicine, London, and Leonard Williams, M.D., Late Physician to the French Hospital, to the German Hospital and to the Metropolitan Hospital. Cloth. Price, $3.00. Pp. 179, with 5 illustrations. Baltimore: Wm. Wood & Co., 1937.

Doctors Humphris and Williams state that in this book the term "emanotherapy" is used instead of radon therapy and mild radium therapy to avoid any possibility of mistaking it for treatment by radium itself. The small amounts of radon are used in radioactive waters, ointments, muds and baths.

The first chapters are devoted to general and technical considerations and the methods of application. Then there are chapters on emanotherapy in gout, chronic rheumatism, gynecology, dermatology and oto-rhinology.

In the preface the authors state that this book is in no sense a text-book of emanotherapy; its aim is to convey clear information on a useful therapeutic agent and to indicate those diseases in which emanotherapy has been found useful. It gives an excellent bibliography on the subject, but it does not give a critical analysis of those diseases where this form of therapy is useful. Humphris and Williams believe it to be successful in gout, rheumatism, salpingitis, sterility, psoriasis, pruritus, mycosis fungoids, eczema, lichen, diseases of the respiratory organ and upper air passages. To this wide list they add rejuvenation and, under impotence, they state: "The benefit in the treatment of impotence is probably the best known property of radium emanation." In reading over this list one wishes for a more critical survey and more controlled clinical evidence of the value of emanotherapy. Much of the discussion is too fragmentary and sketchy to be of value to one seeking a knowledge of this subject.

ATHLETIC INJURIES: PREVENTION, DIAGNOSIS AND TREATMENT. By Augustus Thorndike, Jr., M. D., Surgeon in the Department of Hygiene, Harvard University; Assistant in Surgery, Harvard Medical School; Associate Surgeon, Children's Hospital, Boston, Massachusetts. Cloth. Price, $3.00. Pp. 208, with 104 illustrations. Philadelphia: Lea & Febiger, 1938.

This monograph describes the author's experience over a period of six years as a surgeon in the Department of Hygiene at Harvard University. The book is divided into three parts. Part one, on the prevention of injuries in athletics, considers physical fitness, physical training, physical fatigue and aids in the prevention of injury. Part two, on the more common types of injury, considers sprains, strains, contusions, dislocations, fractures, internal injuries, infections, inflammations, lacerations and abrasions. Part three considers the more common regional injuries, their diagnosis and treatment. The last chapter discusses the important part played by physical therapy in the treatment of athletic injuries. However, this chapter is entirely too brief for the important part physical therapy has in the treatment of injuries. Several statements show a lack of familiarity with physical agents; for instance, "ultra-violet ray" is listed under apparatus used for heat applications; hot moist towels are listed as giving more heat penetration than "diathermy" (high frequency), and the carbon light bulb is listed as giving less penetration than the "infra-red ray."

This volume can be recommended to physicians and physical therapists treating athletic injuries.

THE FOOT. By Norman C. Lake, M.D., M.S., D.Sc. (Lond.), F.R.C.S. (Eng.), Senior Surgeon and Lecturer on Surgery, Charing Cross Hospital, Director of Studies, London Foot Hospital, Late Senior Examiner in Surgery, University of London, and External Examiner in Surgery, Victoria University, Manchester. Second Edition. Cloth. Price, $4.50. *Pp.* 366, *with* 113 *illustrations. Baltimore: William Wood & Co.,* 1938.

The first edition of this book appeared in 1935 and its value is proven by another edition being required in three years. This book is of value to the physical therapist for several reasons—not the least of which is the excellent chapter on the evolutionary development and the anatomy of the foot. The chapter on shoes discusses the development of footwear from the papyrus sandals used about 3500 years ago to our present footwear. In some sections little attention is given to physical therapy; for instance, in thirty pages on flat foot only a half page is given to the treatment by exercise.

The following conditions are discussed, abnormalities, injuries and infections of the foot; flat foot; hallux valgus, rigidus, and flexus; hammer toe; warts and corns; affections of the nails; pes cavus; metatarsalgia and painful heels; bursitis, swelling of the foot and ankle; chillblains, and vaso-spastic lesions; ulcers; new growths; osteochondritis and apophysitis; congenital club foot; and miscellaneous conditions.

PHYSICAL EXERCISES FOR ASTHMA. Approved by the Honorary Medical Advisory Committee of the Asthma Research Council. Second edition. Paper. Price, 1 *s. Pp.* 32, *with illustrations. London: Asthma Research Council, King's College,* 1937.

This booklet explains in detail the exercises used as an adjunct treatment of asthma. The illustrations are excellent. This book shows that the first object in treating a chronic asthmatic patient by exercises is to restore the lungs and chest cavity to their normal size; in an early case, in which the muscles of the chest have not yet assumed a short length which keeps the lungs over-distended, the object of treatment is to prevent this from occurring. Ordinary breathing exercises, the purpose of which is to increase the expansion of the chest, are therefore of no use, as the asthmatic is already capable of expanding his chest to its greatest possible distension. This pamphlet is recommended.

HEART DISEASE IN GENERAL PRACTICE. By Paul D. White, A. B., M. D., Assistant Professor of Medicine, Harvard University Medical School, Boston. National Medical Monographs. Edited by Morris Fishbein, M. D. Cloth. Price, $3.00. *Pp.* 338, *with* 47 *illustrations. New York: National Medical Book Co., Inc.,* 1937.

This monograph presents a practical summary of the present knowledge of the diagnosis, prognosis and treatment of heart disease. The author found in the teaching of graduate courses on this subject that the question and answer method had great value. Therefore, much of the subject matter in this volume is presented in this manner. Controversial questions and rare exceptions have been omitted. This is a valuable book for the general practitioner.

CHIROPODY, THEORY AND PRACTICE. By Franklin Charlesworth, F.B.A.Ch. Foreword by W. Sayle Creer, M. Ch. (Orth.) F.R.C.S. Cloth. Second Edition. Price, 15 *s. Pp.* 205, *with* 57 *illustrations. London: The Actinic Press, Ltd.,* 1938.

This is a textbook for the student and practicing chiropodist. The foreword is by an orthopedic surgeon who states that for the author, as for all honest chiropodists, quick cuts to success, arch supports, the selling of shoes and the commercializing of "foot treatments" do not exist.

The first seven chapters discuss anatomy. There are chapters on bacteriology, sterilization in surgery, the skin, materia medica, foot orthopedics, diseases of the bones, inflammation, synovitis, bursitis, bunion, helomata, verrucae, nail diseases and deformities, paddings and strappings, skin diseases, disorders of the circulation, electrotherapy and footwear. Some of the information is inaccurate. For example, in discussing the high frequency current surface electrode, the author states: "The ray emitted by the electrode is antiseptic in its action." But on the whole the statements are correct.

The author frequently directs attention to the fact that certain conditions are "a matter for the physician rather than the chiropodist." In some cases physical therapists are asked to treat minor foot ailments which come under the heading of chiropody. For those interested in the subject this book is recommended.

THE EVOLUTION OF CHRONIC RHEUMATISM WITH TREATMENT TO CORRESPOND. THE PREVENTIVE CLINIC AS A FIRST LINE OF DEFENSE. By R. Fortescue Fox, M.D., F.R.C.P. Founded on a lecture delivered at Margate, at the Congress of The Royal Institute of Public Health and The Institute of Hygiene, May 1937. *Paper. Price,* 2 *s.* 6 *d. Pp.* 26, *with* 5 *illustrations. London: H. K. Lewis & Co., Ltd.,* 1938.

This brochure is founded on a lecture given by the author at the Congress of the Royal Institute of Public Health. It is of value to physicians interested in physical therapy because in this lecture Fox has given first place among remedies to heat because he believes it is a *sine qua non* of life and that every least variation in external heat produces its proper physiological reaction in the organism. He also emphasizes that the reactions to external heat in the rheumatic subject in the various phases of the disease are little understood and are greatly in need of investigation.

ERGEBNISSE DER BIOPHYSIKALISCHEN FORSCHUNG. Edited by Prof. Dr. B. Rajewsky. Band 1. *Ultrakurzwellen: In ihren medizinisch—biologischen anwendungen. Von H. Dänzer, H. E. Hollmann, B. Rajewsky, H. Schaefer, and E. Schliephake. Paper covered,* 19 *marks; cloth bound,* 27 *marks. Pp.* 296, *with* 24 *illustrations. Leipzig: Georg Thieme,* 1938.

This volume is just another book extolling the specific effects of short and ultrashort waves. It is a disappointing treatise inasmuch as all the evidence presented to support the thesis is secured on nonliving materials or tissues. They use the phantom model methods which many workers believe do not give the information necessary for proof. The volume is full of mathematical computations and unless one is mathematically minded it is difficult reading. Rajewsky gives an accurate history of the evolution of short wave therapy and states the problems which must be faced and solved to place this therapy on a solid foundation. Many of the important investigations made in America apparently have not been reviewed by most of these writers. This volume cannot be recommended for those who are novices in the field of short wave therapy. It will be pleasing, however, to those who believe in the specific and biological effects of short wave therapy.

HANDBOOK OF PHYSIOLOGY AND BIOCHEMISTRY. By the late W. D. Halliburton, M. D., LL. D., F. R. C. P., and R. J. S. McDowall, M. D., D. Sc., F. R. C. P., Professor of Physiology, University of London, King's College, London. Thirty-fifth edition. Cloth. Price, $5.50. *Pp.* 973, *with* 373 *illustrations. Philadelphia: P. Blakiston's Sons & Co., Inc.,* 1937.

The handbook is not primarily a text book but was written by the authors for students preparing for examination. From this viewpoint the handbook has been exceptionally well presented and should prove invaluable not only to the medical student but also the physician who wishes to review physiology. The latest viewpoints regarding the humoral transmission of nerve impulses, enzymes, vitamines, carbonic anhydrase and sex hormones are presented. The authors have inserted in dark type important points to be memorized by the student as he goes along. This book is highly recommended to both physicians and physical therapy technicians. It is well illustrated by many new and original diagrams and in addition has four excellently colored plates.

MIDDLE AGE IS WHAT YOU MAKE IT. By Boris Sokoloff, M.D., Sc.D. Cloth. Price, $1.75. *Pp.* 204. *New York: The Greystone Press,* 1938.

The basic idea of this book is to point out once more that middle age is the climax of a man's life, the period of his greatest creative activity. The author believes that it is an indisputable fact that the health of the middle-aged man has been sadly neglected, and this neglect is his own fault. This book emphasizes that a man approaching forty needs certain re-adjustments and a system of living which would allow him to go through middle age in good health.

The author believes that the history of all our great men and women teaches us that the inferiority complex in regard to the feeling that happiness has been lost because of age arises from a mistinterpretation of the familiar conception that life and happiness belong to the young. This book shows that "middle age is what you make it" and teaches how to make middle age a period for achievement and one of physical and spiritual maturity. Every person between thirty-five and seventy-five should read it.

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